WHO CHRONICLE

VOL. 15, No. 5-6 - MAY-JUNE 1961

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WORLD HEALTH ORGANIZATION

In this issue

- *People and whole tribes move freely over great tracts of Africa in search of seasonal employment for themselves or food for their animals. These population movements, which ignore political boundaries, are an obstacle to malaria eradication (see page 228).*

- *Live poliovirus vaccine has been successfully used on a wide scale in several eastern European countries. Studies on the live vaccine are continuing elsewhere (see page 168).*

- *Institutional treatment of tuberculosis is not practicable everywhere. Hence the interest in WHO-coordinated studies on domiciliary treatment. But some delegates at the Fourteenth World Health Assembly saw danger in a too precipitate closure of sanatoria and exclusive reliance on domiciliary treatment (see page 167).*

- *Only a few years ago 1 336 000 000 people lived in areas where malaria was endemic. Now malaria has been completely eradicated from areas containing a population of 298 000 000 (i.e., 22.3% of the former total). Not only so, but programmes to eradicate malaria are under way in areas with a population of 612 000 000 (45.9%). These figures bear witness to the unprecedented scale of the attack on this single disease. But there is another side to the picture : 255 000 000 people (19.1%) live in areas where no malaria eradication campaigns have yet been planned (see page 201).*

- *It is expected that, in three years' time, the entire population of India—more than 400 000 000 people—will have been vaccinated against smallpox (see page 169).*

- *Tuberculosis was the subject of the World Health Assembly's Technical Discussions in New Delhi. Participants from many countries summarized their knowledge and discussed what type of control measures have so far proved their worth (see page 183).*

- *The Republic of Peru and the Republic of Colombia recently signed an agreement under which they will co-ordinate their malaria eradication programmes and take joint action against smallpox and yellow fever (see page 231).*

- *In parts of Africa more than 50% of the population are blind because of onchocerciasis, with serious social and economic consequences. Methods for the control of the disease are urgently needed (see page 170).*

- *Recent studies of the past history of the treponematoses suggest that " in some fifty years' time, the only surviving treponematosis will be a rapidly spreading mild venereal infection" (see page 226).*

- *An international standard for antistreptolysin-O has just been established. This will help in the diagnosis of rheumatic fever, since infection with Group A haemolytic streptococci is now recognized as the only established inciting factor in acute rheumatic fever (see page 231).*

FOURTEENTH WORLD HEALTH ASSEMBLY—2

The April number of WHO Chronicle *contained an account of the opening of the Fourteenth World Health Assembly, which was held at Vigyan Bhavan, New Delhi, India, from 7 to 24 February 1961. The article that follows is a summary of the discussions on the Director-General's annual report, and of the Assembly's principal decisions.*

DISCUSSIONS ON DIRECTOR-GENERAL'S REPORT

The discussions on the Director-General's report on the work of WHO during 1960,[1] gave delegates to the Fourteenth World Health Assembly an opportunity to express the views of their governments on the Organization's policies and achievements, and to report on public health developments in their respective countries. A comprehensive account of the discussions will be found in the verbatim record of the plenary meetings and the minutes of the committees and subcommittees.[2] The following summary covers some of the main items of discussion.

Malaria eradication

The delegates of a number of countries gave details of progress in their malaria eradication programmes. In Colombia, for example, where about 25% of the health budget is devoted to malaria eradication (started in 1958), the incidence of the disease has dropped from 64.6 per 100 000 inhabitants in 1944 to 9.46 in 1959. In Ceylon, full-scale eradication began, with help from the US International Co-operation Administration (ICA) at the end of 1958; the parasite index of fever cases has been reduced from 6.4 in 1957 to 0.07 in 1960, and the infant parasite rate to zero.

In Ethiopia, a semi-autonomous national malaria eradication service has been set up, with the help of WHO, UNICEF and ICA. The service has a central headquarters in the capital and two provincial headquarters with up-to-date laboratory facilities. The malaria eradication training school in Ethiopia, financed by the WHO Malaria Eradication Special Account, has graduated 65 malaria workers so far. In the Republic of Korea, where a WHO-assisted eradication campaign started in 1959, malaria has almost disappeared, except in a few residual foci. Lebanon—where before 1946 about half the population was exposed to malaria—was by 1960 the first country in the Eastern Mediterranean Region to have completely stopped the transmission of malaria over the whole of its territory.

When the malaria eradication programme began in Mexico four years ago, there were 2 500 000 cases annually, with 250 000 deaths, in a malarious area of 1 300 000 km². In 1960, blood tests gave only 1396 positive results, and there were no deaths from the disease. Insecticide spraying is being combined with chemotherapy, except in areas already placed under surveillance. Forty-nine countries have already sent malaria workers for training in Mexico.

The malaria control programme in Yugoslavia was converted to one of eradication in 1959, though even before that date significant improvements had been noted: before the Second World War there were about 500 000 cases in an epidemic year, in 1946 there were 84 000, and in 1958 only 1208. The disease is now practically eradicated from the country, apart from Macedonia.

A pre-eradication pilot project protecting 500 000 people has been in operation in the

[1] *Off. Rec. Wld Hlth Org.*, 1960, 105.
[2] *Off. Rec. Wld Hlth Org.*, 1961, 111.

north of Nigeria for the past six years; transmission has not been interrupted, but the general health of the people has been greatly improved, and the epidemiological investigations have yielded much useful information. Operations in Saudi Arabia are still in the pre-eradication stage and it is hoped to start eradication in 1962; thanks to WHO assistance, the Mecca Pilgrimage area, where there were formerly cases of malaria due to *Anopheles gambiae*, has remained completely free from the disease since 1954. In the United Arab Republic a country-wide eradication programme has been planned, with the technical advice and assistance of WHO. The campaign is expected to last for about ten years, and a considerable proportion of the national budget will be devoted to it.

It was thought that malaria had practically disappeared from Argentina, but in August 1960 an epidemic broke out with more than 5000 confirmed cases. Under an agreement signed between the Government, UNICEF and WHO, a full-scale antimalaria programme has been launched, and it has proved possible to achieve control in 60% of the epidemic area. It is anticipated that the disease will be eradicated in another two years. In Haiti, a tendency for malaria to spread and an increase in its incidence have led to a renewal of the eradication campaign.

In Paraguay, where spraying—covering an area of 110 000 km² inhabited by 850 000 people (about half the population)—is in its fourth year, the incidence of malaria has been reduced to 2.4%. Nevertheless, it is now realized that certain mistakes were made in the planning of the campaign, and that the disease is more prevalent and the vector more widespread than was at first believed. In Thailand, assessment of the eradication programme by a WHO advisory team showed that transmission had stopped in the northern plain areas, but was still continuing in northern hilly areas and in the south of the country. Steps are accordingly being taken to reorganize the campaign. The conclusion to be drawn from the campaign to date, stated the delegate of Thailand, is that a strict eye has to be kept on the work, otherwise results may not be commensurate with expenditure.

The two problems most frequently mentioned by delegates were those of reintroduction of malaria and insecticide resistance. In a number of countries in Africa, movements of nomads are hampering the success of operations; in Chile, the disease has frequently been reintroduced by nomadic workers. In Cyprus, where eradication has been achieved, a system of maintenance control has been established to avert the reintroduction of the disease by visitors, or aboard ships and aircraft. A number of delegates stressed the importance of co-ordinating campaigns in border areas of neighbouring countries to avoid this danger.

In Ecuador, after four years of eradication operations, resistance to dieldrin has occurred, so that it has become necessary to change to DDT. In view of the heavy financial burden involved, an arrangement has had to be made to transfer responsibility for eradication operations from the national malaria service to the Inter-American Co-operative Public Health Service, WHO continuing to provide technical advice, and UNICEF and ICA supplies and equipment. The delegate of Italy stressed the fact—mentioned in the Director-General's report—that, even where resistance to a given insecticide has occurred, it may be possible to continue using that insecticide. Research on this subject is being carried out at the International Insecticides Centre, Rome, as well as tests with organophosphorus insecticides, alone or in combination with DDT. The delegate of Indonesia stated that resistance to DDT was encountered in one area of his country four years ago, but that a recent reversion to DDT spraying in that area is proving effective.

While expressing satisfaction with the encouraging results obtained in pilot projects in tropical Africa, the delegate of Ghana said that caution is still required because of the resistance problem. He suggested that malaria be included in the list of notifiable diseases where eradication programmes have been initiated, and that special international travel legislation be passed in order to prevent the reintroduction of malaria into protected areas.

In certain countries, good results have been obtained with a dosage of 1 g of DDT per m^2, instead of the standard dosage of 2 g per m^2 recommended by the WHO Expert Committee on Malaria. In his summing up of the discussions on malaria eradication by the Committee on Programme and Budget, Dr P. M. Kaul, Assistant Director-General of WHO, stressed that, while a dosage lower than that recommended by the Expert Committee may be effective in one or two areas, this does not mean that it will be effective in all. The Expert Committee has, however, recommended that special studies on this point be made in each country contemplating a malaria eradication programme or a change of dosage: if it appears from such studies that lower dosages are effective, those dosages will be recommended.

Tuberculosis

Recent developments in tuberculosis control, and in particular the study of domiciliary chemotherapy now proceeding at the Tuberculosis Chemotherapy Centre, Madras, India, have aroused wide interest. These developments were the subject of the technical discussions held on the occasion of the Assembly (see page 183), and were also referred to in the discussions on the Director-General's report.

The delegate of Chile said that the domiciliary treatment of tuberculosis with isoniazid is of particular interest to his country, since institutional treatment is not practicable in countries with a weak economy. He thought, however, that it is dangerous to base control services exclusively on domiciliary treatment and to close sanatoria too precipitately. The delegate of Greece said that there is growing recognition in the more developed countries of the value of a tuberculosis dispensary service combined with mobile mass radiography surveys for an intensified case-finding programme and early detection, to be followed by domiciliary treatment. Such a service might also be feasible in economically less developed countries. To ascertain the prevalence of tuberculosis in these countries, research based on new simplified methods is necessary. In the opinion of the delegate of Turkey, some of the methods used in control programmes are too costly and lengthy, and he was therefore pleased to note the results of the chemotherapy studies. He regretted that no progress report is available on studies of freeze-dried BCG vaccines and hoped that further information will soon be forthcoming.

A number of delegates gave details on national tuberculosis control programmes. In Cuba, preventive services have been intensified and BCG vaccination has been administered to more than half a million children. The prevalence of the disease in Ethiopia is unknown, but the health centres that have recently been set up in the remoter parts of the country are gathering data on the subject so that the present BCG vaccination programme can be carried out on a wider basis. A tuberculosis control demonstration and training centre in Addis Ababa has been operating successfully with the help of WHO since 1959. In Iraq, the control project that started a few years ago with WHO assistance is being carried on throughout the country by the national health administration; a WHO prevalence survey team is at present working there in co-operation with national teams. In the Republic of Korea, approximately 700 000 persons (3% of the population) are estimated to be suffering from active pulmonary tuberculosis, yet there are only 4000 hospital beds available for tuberculosis patients. With help from ICA, nearly 30 000 patients are receiving ambulatory treatment at 220 local tuberculosis clinics, but the problem of effective control measures remains to be solved.

Antituberculosis work in Lebanon entered a new phase in 1958 when the Beirut Antituberculosis Centre was started with help from WHO. Of 46 000 persons examined by mass radiophotography, 1400 were found to be infected. Domiciliary or sanatorium treatment was prescribed for these patients according to the individual merits of each case. However, for the programme to be successful, at least four antituberculosis centres are needed in the provinces. It is planned to extend tuberculin-testing and BCG vaccination to all schoolchildren, but

the procurement of the necessary supplies of tuberculin and BCG is a difficulty. Tuberculosis is a serious health problem in Libya, partly owing to a shortage of qualified personnel; a tuberculosis survey of the country was recently completed with help from WHO and UNICEF, and control measures are being adopted. In Poland, the Government has intensified its antituberculosis work, and legislation has been passed for a systematic campaign; the national health authorities are co-operating closely with WHO and UNICEF.

It has been estimated from a sample survey that there are almost 200 000 cases of infectious tuberculosis in Mali. A shortage of staff and funds, however, makes it impossible to start a control campaign in the near future.

The delegate of Canada, as President of the Canadian Tuberculosis Association and on behalf of the Government of Canada, extended a cordial invitation to all governments to send delegates to the sixteenth biennial meeting of the International Union against Tuberculosis, which is to be held in Toronto in September 1961.

Venereal diseases and treponematoses

The delegate of Iran stated that the WHO-assisted venereal disease control programme which started in his country in 1953 has proved so successful that it is now difficult to find primary and secondary cases of syphilis for study by medical students. The delegate of Peru also stressed the importance of the Organization's work for the control of the venereal diseases. Syphilis has diminished in importance in his country, though the other venereal diseases and in particular non-specific urethritis continue to be a problem.

The delegate of Italy expressed concern over the increased incidence of certain venereal diseases. He thought that WHO should study the reasons for failures in venereal disease control, and should intensify its research programme in this field. He welcomed the encouragement given by the Organization to the experimental culture of pathogenic treponemes *in vitro* and other specific items of research.

Various delegates spoke of the progress of yaws control in their respective countries. In Colombia, where the disease was active along the whole Pacific coastline, an eradication campaign using antibiotics is proving so successful that it is now possible to proceed with plans for the Pan American highway to pass through this area. An antiyaws campaign began in Mexico last year; it is estimated that some 300 000 Mexicans are affected by the disease, and so far 100 000 of them have been treated. In Nigeria the yaws control project, which started in 1954, provided treatment for more than 7 million people and clinical examinations for some 21 million by 1 July 1960.

Poliomyelitis

Following a poliomyelitis epidemic caused by type 1 virus in Colombia, a mass vaccination campaign has been carried out using the Cox-Lederle strains of live attenuated virus. Some 400 000 vaccinations have been performed in children under 6 years of age, among whom not a single case of poliomyelitis has occurred.

Impressive results have been obtained with Sabin-type live poliovirus vaccines in Czechoslovakia: in the spring of 1960, 3 500 000 children (about 93% of these between 2 months and 14 years of age) were vaccinated, and in the second half of the year—the period of seasonal increase in poliomyelitis—there was not a single paralytic case among children. Live vaccines (Koprowski strains) have also been successful in Poland, where oral doses of type 1 followed by type 3 vaccine have been found to confer 88% protection. The most striking feature of the epidemiological situation after live virus vaccine, the delegate of Poland said, is the reversal of the seasonal epidemic curve of the disease. In Romania, the free vaccination of the population below the age of 30 (more than 10 million persons) is being carried out with live poliovirus vaccine.

In Yugoslavia, too, it has been decided to use the live vaccine. In the autumn of 1960,

more than 2 million Yugoslav children were vaccinated at the height of the epidemic season. The results have been most encouraging, and a rapid drop in mortality has shown that the live vaccine is fully effective even when used during the dangerous period. Regulations are being drafted to make anti-poliomyelitis vaccination compulsory in Yugoslavia.

Last year, only 500 000 children were vaccinated against poliomyelitis in Mexico, but this year 5 500 000 will be vaccinated with Salk vaccine. Live vaccine will also be administered to half a million children after testing.

In the Netherlands, immunization with inactivated vaccine started in 1957: 85% of the children under 15 have had three primary subcutaneous injections and a booster injection. In 1957, 203 cases of poliomyelitis were notified, of which 163 were paralytic; the total numbers of cases in 1958, 1959 and 1960 were 39, 11, and 26, respectively. Vaccination cannot be given all the credit, however, as years with a low poliomyelitis frequency form part of the normal epidemiological pattern. Though studies on live vaccine are continuing in the Netherlands, the very low morbidity has led the Government to the conclusion that it is preferable to continue administering inactivated vaccine, because (*a*) the most vulnerable part of the population seems to be acquiring a degree of immunity; (*b*) the spread of the poliovirus is very restricted with the inactivated vaccine; and (*c*) it is uncertain whether live vaccine will give greater individual protection than inactivated vaccine.

The delegate of Israel hoped that WHO would give a clear lead on whether to adopt live vaccines or to continue using inactivated vaccines. On the basis of the results achieved with the Salk vaccine, Israel, like the Netherlands, has decided to continue using inactivated vaccines for the time being. Experience in Israel had shown that at least three vaccinations and probably four are necessary to ensure immunity. The delegate of Chile also said that it would be helpful for the Organization to define its position regarding live vaccines.

Smallpox

The delegate of Argentina announced that his Government had offered WHO 10 million doses of vaccine for the world-wide smallpox eradication programme. In Ecuador, where smallpox eradication was undertaken in 1958, about 32% of the population has now been protected. The Pasteur Institute of Ethiopia has started to produce freeze-dried vaccine to be used in smallpox control programmes by 37 health centres established in the remoter provinces of the country; 150 000 doses have been produced so far.

In India, in addition to the normal vaccination programme, which is going on continuously, 24 million people will be vaccinated before the next hot weather, and the entire population is expected to be covered in the next three years. No case of post-vaccinal encephalitis or other untoward result has been reported among those already vaccinated. In the Republic of Korea, smallpox has been brought under complete control, with only two cases in 1960.

A law passed in the Lebanon in 1959 has made smallpox vaccination compulsory every four years as a preventive measure, although the country is free from the disease. In a general vaccination campaign held from April to November 1960, more than 1 million persons (or 76% of the total population of the Lebanon) were vaccinated, the vaccine being supplied by Jordan through the intermediary of the WHO Regional Office for the Eastern Mediterranean. In Paraguay, 86.4% of the population has been vaccinated and the incidence of the disease has rapidly declined, no cases being recorded in 1959.

Infectious hepatitis

Infectious hepatitis is on the increase in the Netherlands, where it is a notifiable disease. In 1955, there were 3113 cases; in 1959, 9439 cases; in 1960, 16 717 cases. Most were children of school age, but adults also were affected and the disease caused prolonged absenteeism. Knowledge of the disease is very limited as far as epidemiology, pathology and prevention are concerned. The Netherlands National Health Council is making an

inventory of investigations in progress and research to be promoted in this connexion. The delegate of the Netherlands asked WHO to assist governments by disseminating information about the disease.

During 1959, about 75 000 cases of infectious hepatitis were reported in Poland, a rate of 260 per 100 000. The incidence in 1960 was similar. The delegate of Poland suggested that WHO should investigate the whole situation as regards this disease; this suggestion was also made by the delegate of Israel.

Parasitic and mycotic diseases

The delegate of the United Arab Republic stated that bilharziasis is one of the major problems in his country, where 5-year pilot control projects have been started with help from WHO and UNICEF. It is hoped that the evaluation during these projects of the methods used so far for the control of the disease will be helpful, and that effective new methods will emerge. The delegate of Ghana said that bilharziasis is a problem to which no effective solution has been found, despite many years of research. WHO has been assisting projects in various countries, including his own, and it would be helpful if these countries could be given information on the difficulties encountered and the prospects for future control of the disease.

In the Argentine, the reduviid vector of Chagas' disease is found in about 50% of houses in provincial capitals and the disease is responsible for a large number of sudden deaths. A pilot project for the eradication of the vector was accordingly undertaken in 1960. Operations are under way in the Provinces of La Rioja and Chaco, and preliminary reconnaissance has started in ten other provinces. The endemic area covers three-quarters of the country and has a population of 11 million. Studies on Chagas' disease have also been undertaken in Paraguay, and the Argentine health services have agreed to train Paraguayan technical staff for a future control programme. In Colombia, the vector of the disease has become resistant to insecticides, and the incidence of the disease is increasing. The delegate of that country considered that every malaria eradication programme should be followed by a campaign against trypanosomiasis.

Referring to the prevalence of mycotic diseases in the Eastern Mediterranean Region, the delegate of Israel mentioned the effectiveness of griseofulvin against ringworm of the scalp in trials conducted in his country, and suggested that the UNICEF/WHO Joint Committee on Health Policy should recommend the supply of this product to all countries where the disease is a public health problem. The delegate of the Sudan stated that, although maduromycosis is not mentioned in the Director-General's report, this disease in all its forms is extremely common in his country.

The delegates of several African countries spoke of the ravages of onchocerciasis among their populations. The disease is on the increase in Ghana and its ocular manifestations are responsible for the depopulation of large areas; it is the chief cause of the 65 000 cases of blindness in the country. In certain areas of the Republic of Mali and the Republic of Upper Volta, more than 50% of the population are blind because of onchocerciasis. The disease is also responsible for the depopulation of parts of the Republic of Senegal. The delegate of the Sudan said that onchocerciasis is very common in one area in his country, and he would be very grateful if WHO would supply information on the appropriate diagnostic techniques.

The delegate of India said that, while the Director-General's report stresses the steps taken to deal with onchocerciasis, Bancroftian filariasis does not appear to be receiving the attention it deserves. In India, a programme for its control has been initiated in certain selected areas of high endemicity by means of chemotherapy and an attack on the transmitting mosquito, but the results have not been encouraging and many problems requiring intensive study have come to light. These problems must be investigated both in the laboratory and in the field so as to discover a suitable method of control. The delegates of Ceylon and Indonesia

also appealed for a more positive approach to the control of this disease.

Dr P. M. Kaul, Assistant Director-General of WHO, pointed out that the proposed programme for 1962 includes research on the pathology of filariasis and onchocerciasis. A consultant has been collecting comparative data for the Organization, and the Director-General has been endeavouring to stimulate international seminars and conferences on the filariases, in addition to the conference on onchocerciasis to be held in Africa this year. Developments, Dr Kaul said, are not yet sufficient for conclusive results; the best hope seems to lie in the control of the vector, towards which the main effort is being directed.

Leprosy

The delegate of Argentina said that a leprosy programme was organized in Argentina at the end of 1960. In Ethiopia, an active nation-wide leprosy control programme including rehabilitation measures is being carried out. In the Malagasy Republic almost 20 000 leprosy cases are under treatment, and assistance from UNICEF will permit the further development of training and control services. In Mexico, a leprosy control programme, which will be integrated into the normal national health services, is at present under study, and 40 leprologists are undergoing training.

Encouraging results are reported from the leprosy programme in Nigeria: control started in 1952 with some 25 000 patients under treatment, the total rising to over 300 000 by the end of 1959. Many of the patients have returned to normal life in full health.

The Republic of Upper Volta, stated the delegate of that country, has the doubtful privilege of being one of the West African States most affected by leprosy: there are 113 000 registered cases, the average morbidity rate being 3%, rising to 10% in some areas. A control programme is in progress with help from UNICEF and the French Fonds d'Aide et de Coopération.

The delegate of India considered that WHO should sponsor both fundamental and applied leprosy research on a large scale and over widely dispersed areas. He urged particularly that there should be co-ordinated studies on the prophylaxis of leprosy either by BCG vaccination or by drugs. The delegate of Indonesia hoped that more attention would be paid to the planning of rehabilitation.

Environmental sanitation

The problem of community water supplies was the chief subject of discussion under this heading. Since the problem is financial as well as technical, it was suggested by several delegates that WHO should do more to help countries find funds for their water supply projects in the form of loans from international banks. An example cited by the delegate of Peru was the loan of $10 million obtained by the Pan American Sanitary Bureau for the development of the water supply and sewage system in Arequipa, his country's second largest city. It was pointed out on behalf of the Director-General that WHO is helping several countries to develop plans of work for community water supply schemes, which will subsequently be submitted to financing authorities such as the Inter-American Bank and the International Development Association. It is prepared to continue this form of assistance, but does not itself participate in the financing of actual schemes.

The delegate of Chile said that the problem of safe drinking-water in under-developed or developing countries is aggravated by the fact that most of them are situated in arid areas. In his own country, the recent earthquakes have destroyed many of the water supply installations. It is hoped that WHO will be able to provide technical help for their reconstruction.

A number of delegates gave details on the steps taken to improve water supplies in their respective countries. In Cuba, a survey made in 1953 showed that, of 300 towns with more than 1000 inhabitants, 184 were without water mains; by July 1960, there were 39 water supply systems serving 950 000 inhabitants, a 38% improvement. One-third of the budget for health in India's third 5-year plan is devoted to the provision of safe water

supplies. In Israel, where 90% of the population, both urban and rural, have adequate water supplies, successful experiments have been carried out in the purification of sewage to provide water for irrigation, and in the demineralization of salt water; the Israeli Government will be glad to make the results of these experiments available to other countries.

In the Republic of Korea, where the population is predominantly rural, 14% of the inhabitants receive their water from a public supply system, while the remainder depend upon public or private wells, rivers or streams. This has a direct bearing on the 2500 cases of typhoid fever reported there in 1960. An extensive programme for the repair of wells and waterworks is being carried out, and since 1952 thousands of public wells have been dug or renovated with aid from WHO and the US International Cooperation Administration.

In Paraguay, following a survey in 1957, a $2 million programme has been undertaken for the improvement of the water supply systems of the country's ten main cities. The pilgrimage cities in Saudi Arabia have been provided with a new and sanitary water supply system. Pure water supplies are available to 90% of the population, both urban and rural, in the United Arab Republic, and it is hoped that they will be available to the whole population by the end of 1962.

The delegate of Czechoslovakia thought that more attention should be paid to the public health aspects of housing and urbanization; his country hopes to solve its housing problem within the next ten years by the provision of some 1 200 000 dwelling units. The delegate of Ceylon suggested that research should be undertaken on a cheaper type of hygienic house.

In Czechoslovakia, health services are carrying out research on the effects of air pollution on health, and initiating the necessary control methods. A great deal of work on air pollution is also being done in the USSR, where scientists have established permissible standards for air pollution concentrations; practical courses in air pollution control are provided in special centres in the various cities. The delegate of Chile considered that more attention should be paid to air pollution outside Europe.

It was suggested by the delegate of Czechoslovakia that WHO should examine the problem of the effect of noise on health, in cooperation with such bodies as the International Labour Organisation and the International Organization for Standardization.

Several delegates suggested that research on insect vectors, particularly the house-fly, should be intensified.

Public health services

The delegate of Israel stressed the importance of linking the public health programme with community development in the less developed countries, and suggested that community development in relation to the public health services should be selected as the theme of the technical discussions at a future World Health Assembly. The delegate of the USSR also considered the concept of public health as part of a wider scheme of economic and social development to be of great importance. He cited the public health services in the Tadjikistan SSR as a good example of public health administration that might be of use to WHO in assisting programmes in similar areas.

The delegate of the United Kingdom gave details on the diploma course on medical services administration provided by Edinburgh University. The second of these courses is now being given to 12 participants, of whom 4 have been sponsored by WHO. Of the present class, 7 hold medical degrees, 1 is an arts graduate with administrative and research experience in nursing, and the remaining 4 have experience of administration in the hospital or government service. With the continual development of schemes of medical care, it is of the utmost importance that doctors and appropriate laymen should be trained in the essentials of medical administration. It was announced that a similar course will be held in French at the University of Brussels, starting in October 1961. Enrolment will be limited to 10 persons, and participants have already been invited.

The delegate of the Netherlands observed that WHO is continuing its studies on costs and methods of financing systems of medical care in relation to public health. Studies of this kind in the industrialized countries, he believed, will reveal that the proportion of the over-all expenditure on medical care services that is being devoted to hospitalization is steadily rising. This means that more nursing homes are needed to care for persons not necessarily requiring hospitalization. The nursing home is more appropriate, for example, for taking care of chronic patients in the older age groups. The Netherlands delegate also welcomed the convening by WHO of a group of experts to make recommendations on research in public health practice. Public health reference centres could give valuable help in such a research programme, and could also develop health education activities.

The delegate of Italy noted that the Director-General's report recommends the integration of hospital and public health laboratory services under one unified system of administration. He did not agree with this concept, as he considered that the tasks of national hospital laboratories and those of public health laboratories are entirely different: hospital laboratories simply carry out examinations and assist in the diagnosis and treatment of patients, whereas public health laboratories have a much wider range of functions, including the control of water quality, foodstuffs and pharmaceutical products, the study of air pollution and radiation levels, and a number of other tasks that cannot be performed by a hospital laboratory. The delegate of China (Taiwan) considered that, although the functions of health and hospital laboratory services differ, they have certain tasks in common and operate more efficiently if they are combined under one central authority for technical supervision. It was pointed out by Dr P. M. Kaul, Assistant Director-General of WHO, that the integrated approach to hospital and health laboratory services is recommended primarily for developing countries, i.e., for the organization of new services where no satisfactory arrangements already exist.

The delegate of Italy expressed his pleasure at the attention being paid by WHO to the health education of the public. He thought that the Organization should give technical support and encouragement to the integration of health education into the training of doctors and auxiliaries, and to the training of specialized health education personnel. Experience in Yugoslavia, the delegate of that country said, has shown that the health education work carried out by specialists or administrators cannot give full satisfaction, and that emphasis should be laid not on the establishment of special health education services but on the participation of all health workers within the scope of their own particular activities. The delegate of Nigeria stressed the importance of health education of the public in the under-developed countries. He thought that elementary schools could do more to educate both the public and schoolchildren in health matters. In Nigeria, posters are being used as a means of health education, but the scope of the campaign is limited, and it is hoped that WHO will co-operate in extending it.

Reference was made by some delegations to the difficulty of purchasing drugs and equipment, and the way in which this can hold up the health programme. They were reminded that an agreement is already in existence whereby WHO can assist Member States in obtaining these supplies, both through Headquarters and through the Regional Offices.

A number of delegates gave details on the organization of the public health services in their respective countries.

Mental health

In the United Kingdom, 1960 was a particularly important year for mental health work, and the delegate of that country said that at least some of the stimulus for the advances made came from the constructive studies carried out by WHO. Nevertheless, the United Kingdom is experiencing difficulties in the recruitment of trained psychiatrists, and problems will doubtless arise in the near future as a result of the shortage

of trained staff. In the Federal Republic of Germany, new methods are being introduced for the prevention of mental illness and the care of the mentally deficient, while proposals have been prepared for the classification of mental diseases in accordance with WHO recommendations.

The delegate of Sierra Leone spoke of the problems of mental health treatment in his country, where the vacancy for a psychiatrist in the health services has remained unfilled since 1958. A Sierra Leone doctor is training for a diploma in psychiatry—a three years' course—but an experienced psychiatrist is needed until he has sufficient experience to take over, i.e., for a period of at least six years. In the meantime, mental cases requiring specialist treatment have to be sent to the psychiatrist in Ghana.

The delegate of Thailand spoke of the mental health problems arising in his country as a result of socio-economic changes and their impact on Thai culture and tradition. The number of diagnosed cases of psychoses and psychoneuroses has considerably increased—there are now 2 diagnosed cases of frank psychosis per 1000 population, as compared with 1 per 1000 ten years ago. The delegate therefore welcomed the decision of the Executive Board to hold technical discussions on mental health at a future World Health Assembly.

Nutrition

National nutrition programmes were described by the delegates of a number of countries.

In Haiti a programme has been undertaken, with the help of WHO, FAO and UNICEF, to encourage healthy food habits among schoolchildren and to promote increased agricultural production. In the Malagasy Republic, a nutrition service set up four years ago is collecting documentation on malnutrition and distributing a nutrition education booklet.

In 1956, the nutrition service of the Ministry of Health of Paraguay undertook a medico-nutritional survey among the children in the capital and various communities in the interior of the country; this survey was based exclusively on clinical signs and permitted cases of hypovitaminosis and anaemia to be traced. In 1959-60, a survey on food consumption and eating habits was carried out in the capital and 9 villages in the interior, on the basis of a representative sample of the national population. A general table of the present weights and heights of the population is in preparation. In addition, a programme for raising nutritional standards is under way with the collaboration of WHO, FAO, UNICEF and UNESCO. It covers 60 rural communities and aims at encouraging the production, preservation, preparation, and consumption of certain foodstuffs.

All nutrition problems in Poland are now dealt with by a department in Warsaw. Basic data have been gathered on the nutritional status of the population and the most important problems in this field. Nutritional standards based on world standards and appropriate to the conditions and habits of the country have been drawn up. These are being used as a basis for nutrition and food production programmes.

Despite a food surplus, malnutrition exists in Thailand owing to ignorance and the difficulty of changing traditional food habits. With the present rate of increase of the population, the Thai delegate said, undernutrition is bound to complicate the problem in the future.

Education and training

The discussions were centred mainly on the problem of meeting the shortage of medical staff in the emerging countries. It was generally agreed that foreign staff must be considered as no more than a stop-gap solution, and that the main task is to establish national training institutions. At the same time, training must not be speeded up to the detriment of professional standards. Several delegates spoke of the difficulty of obtaining suitably qualified students for fellowships. Again, in some countries the shortage of medical and nursing staff is aggravated by the preference of those who have reached the necessary educational level

for careers offering greater monetary reward with a shorter period of training.

The stress now being laid by WHO on the social and preventive aspects of medical training was generally approved.

Medical research

There was wide appreciation of WHO's programme of expanded medical research, and a number of delegates particularly welcomed the decision to concentrate primarily on research in communicable diseases. The delegate of Israel also welcomed the emphasis on services to research—an important function that only an international organization can satisfactorily perform. The delegate of Ceylon spoke of the decision to provide research grants to individual workers whose activities show sufficient merit; this, he considered, will be of great help to the smaller countries where, in the absence of large research institutions, the burden of research often falls on individual workers.

There were also some criticisms of the programme. The delegate of Greece considered that WHO should leave basic research to organizations devoted exclusively to research, and concern itself with the application of their findings. The delegate of Canada thought that care should be taken to keep WHO's research activities within controllable bounds. He had been struck, during the discussions on the Director-General's report, by the frequent references to the need for research, and wondered whether too much of WHO's resources might not be frittered away in trying to cover too broad a field. He suggested that priority in the present programme be given to subjects related to the Organization's current work.

Several delegates asked what was the relationship between WHO's research work and that of national research institutions, and wondered whether the programme provided for sufficient co-operation with these institutions and co-ordination of national and international work. In reply to this question, the Director-General stated that the Organization has not yet any settled policy in this respect, since the medical research programme is still in a preliminary phase. He believed it essential for the Organization to maintain its freedom of action to contact scientific or research institutes without necessarily having to go first through government channels. Where research conducted in a country is under the control of a central body, WHO would naturally approach that body in promoting research on matters of mutual interest.

Health statistics

The delegate of the United Kingdom gave an account of a new scheme recently introduced in Scotland for the collection of morbidity statistics. For each patient there is a sheet recording full details of his case, dates, and diagnosis of the principal and any other conditions according to the 1955 revision of the International Classification of Diseases. Within a few months after the end of each year, complete statistics are available for that year. It is hoped that this scheme will meet the requirements not only of hospital administrations but also of clinicians and facilitate the study of trends of illness in the population.

Details were also given of a scheme for the compilation of hospital statistics that has been operating in Italy since 1956. It involves more than 2 000 000 filing cards each year; annual results are published and are proving a reliable means of obtaining precise information on hospital morbidity in the country.

A sample health survey that has been carried out in the Federal Republic of Germany since 1957 now includes additional questions designed to provide data for planning and hospital administration. The population willingly answers questions about health, and the results will be published by the middle of 1961.

The Czechoslovak delegation expressed appreciation of the effort being made by WHO to unify and improve statistical methods, and to promote the use of a single classification of diseases throughout the world. Together with Albania, Bulgaria, Hungary, Poland, Romania and the USSR, Czechoslovakia is working on proposals for

the eighth decennial revision of the International Classification of Diseases.

The delegate of India spoke of the work proceeding in his country in connexion with the ten-year population census. New questions of medical and social interest have been introduced, and it is hoped that they will elicit useful statistics on morbidity and the incidence of certain handicapping afflictions.

The delegate of the Central African Republic stated that, owing to a lack of specialized personnel, his country cannot provide the information required by WHO for health statistics. For this reason, his Government would welcome the visit of a WHO statistical consultant.

Much interest was shown in the " tripartite experiment " mentioned in the Director-General's report. This experiment, which aimed at achieving greater uniformity in the application of the coding rules, was carried out by national statistical offices in Canada, the United Kingdom and the United States of America, under the auspices of the WHO Centre for the Classification of Diseases, and involved the use of 6000 death certificates. Dr N. I. Grashchenkov, Assistant Director-General of WHO, stated that the results would be made available in due course to all who are interested.

Biology and pharmacology

The delegate of Norway pointed out that many countries have neither the funds nor the technical facilities required for carrying out control trials of the many new drugs coming on the market. He thought that WHO should take steps to co-ordinate the activities of different countries in this sphere, for example, by collecting and distributing information on completed, current or planned work.

The delegate of Czechoslovakia expressed appreciation of the work done by the Biological Standardization Unit of WHO during 1960. The programme for establishing international reference preparations is, he said, a sound one, but it is important that as many as possible of the new standards should be made use of immediately. Czechoslovak institutes are prepared to undertake some of the preparatory work such as titration. He would like to see a substantial increase in the number of international standards for the quality control of new pharmaceutical substances, so that these standards may be available for use in comparative analyses. It would also be useful if WHO were to function as the arbitration body in respect of new drugs.

In reply to these observations, Dr N. I. Grashchenkov, Assistant Director-General of WHO, said that serious consideration would have to be given to any increase in the number of WHO centres for the standardization of biological preparations, since there have already been suggestions that WHO is spending too much money on contractual obligations. The suggestion that WHO should assume the role of arbitrator in disputes concerning new drugs also needs careful study, since this is a legal function and thus outside the Organization's competence.

The delegate of Ceylon suggested that the WHO Expert Committee on Addiction-Producing Drugs should study not only the epidemiology of drug addiction but also the mechanism of action of the various addiction-producing drugs. The delegate of Colombia urged WHO to intensify work on drug addiction, with special reference to local addictions. In his country there is the problem of coca-leaf addiction, and the Government's ban on coca cultivation is not proving fully successful. Now it has been decided to compensate the population for the destruction of coca trees, and at the same time to encourage and help them to grow remunerative substitute crops.

DECISIONS OF THE ASSEMBLY

Budget for 1962

The Assembly approved an effective working budget of $23 607 180 for WHO in 1962. This represents an increase of 19.3% over the effective working budget for 1961, and comprises the sum of $20 852 000 originally proposed by the Director-General plus several additions approved by the Assembly,

including $2 000 000 for malaria eradication field operations (see below). Introducing the budget, the Director-General said that the figure proposed reflected an attempt to preserve the continuity of WHO's evolution in recent years and the Organization's wish to accept the full responsibility placed on it by the substantial increase in its membership.

Help for the Congo (Leopoldville)

Introducing a report on WHO assistance to the Congo (Leopoldville), the Director-General pointed out that the action of WHO in the Congo was something new for the Organization, since it had been called upon to act in an emergency in which medical services had practically ceased to exist, or had become extremely deficient.

Before the emergency, there had been a large medical staff in the Congo—about 2800 persons, mostly from abroad—as well as a number of hospitals and dispensaries all over the country. As a result of events many of the staff had withdrawn, and WHO was called upon to try to solve the immediate health problem. With the help of the Red Cross teams, many of the hospitals have been kept open and the situation has remained stable. The Red Cross is not, however, a technical assistance agency and can only act during the state of emergency. It has asked WHO to seek a solution to the problem and, in agreement with the Congolese authorities, the Organization is recruiting 130 medical workers. Recruitment began in October, but many difficulties were encountered at the outset; in December WHO accordingly appealed to the Red Cross to extend the stay of its teams for another six months. As a result some 50 Red Cross medical staff will remain in the Congo until June 1961. In the meantime, recruitment has improved, and WHO will be able to provide the necessary staff by the time the Red Cross starts withdrawing its teams. Nevertheless this staff will meet only a small part of the country's needs and—with the doctors remaining in the country—represents the strict minimum required to maintain essential services. A permanent solution to the problem therefore depends on the training of local staff. While some local staff have already gone for training abroad, the important thing is to maintain and improve existing training schools in the Congo itself. WHO is accordingly helping the Medical School of the University of Lovanium in Leopoldville—one of the best medical schools in Africa—to improve and expand its facilities. If the medical school at Elisabethville is reopened, there will be sufficient facilities for training nearly all the necessary staff in the country itself. Much depends, however, on the maintenance and expansion of secondary education in the country, so that enough students of suitable educational standard will be forthcoming for medical training. Thus, although the situation is serious, the basis exists for sufficient medical training to permit the country to have an adequate health service staffed by its own nationals in about ten to fifteen years' time.

During the discussions on this subject, the delegate of the USSR stated that his Government was prepared to send medical staff with full material and equipment to the Congo, covering the costs itself, and also to accept 10 Congolese citizens for accelerated training in medical establishments in his country, as well as 20 Congolese students for full training in medical schools. This offer was made as a contribution to the Voluntary Fund for Health Promotion. A similar offer was made by the delegate of Bulgaria, who said that his Government is prepared to send health teams to newly independent countries in Africa and elsewhere on request, and also to award training scholarships to doctors and medical students from those countries. The Director-General mentioned the contribution already made to the Voluntary Fund by France in the form of mobile teams for the Congo. He also expected soon to be able to report a contribution from Switzerland consisting of fellowships to be taken up at the University of Geneva.

The Assembly unanimously endorsed the resolution of the Executive Board commending the measures taken by the Director-

General in the Congo, and thanked the International Committee of the Red Cross, the League of Red Cross Societies and contributing governments for their part in the operation. The Director-General was asked to draw the attention of the United Nations to the need for giving the maintenance and development of training institutions a very high priority in the emergency programme.

WHO and emerging countries

Noting with satisfaction the speedy assistance given by WHO to the Republic of the Congo (Leopoldville), the Assembly asked the Director-General to continue to give such assistance to all newly independent States that become members of WHO, in particular by training adequate numbers of doctors, nurses, and technical and allied personnel among the indigenous population.

After a lengthy discussion, the Assembly also adopted a declaration concerning the granting of independence to colonial countries and the tasks of WHO in this connexion. Part of this declaration reads as follows:

"The Fourteenth World Health Assembly,

"...Believing that the World Health Organization has an important part to play in promoting the fundamental and inalienable right of colonial countries and peoples to freedom and independence through assistance in raising levels of physical and mental health, and that one of WHO's urgent tasks is to help newly independent countries, and those preparing for independence, to overcome deficiencies in health programmes and serious shortages in trained medical and health personnel;

"1. REQUESTS the Director-General to make all possible efforts to provide such assistance to Member States having newly attained independence and to co-operate with them in the training of local medical personnel technically qualified to undertake the responsibility of combating infectious and parasitic diseases and of improving national health services;

"2. URGES Member States to provide assistance to raise health levels in newly independent countries, and those which are to achieve independence, both through the World Health Organization and on a bilateral basis; and

"3. APPEALS to Member States to introduce or develop in their health education programmes the teaching of the principles of racial equality and non-discrimination, with a view to promoting good mental health and in recognition of the fundamental right of every human being to health and health services."

Malaria eradication

After considering a report by the Director-General on the development of the world-wide malaria eradication programme,[3] the Assembly noted with satisfaction the general progress made in the programme, and urged governments to improve methods of epidemiological assessment and surveillance, and to give full administrative and financial support to their eradication campaigns so as to ensure the thoroughness and efficiency of the operations.

The Assembly also discussed the urgent problem of financing the programme. The Malaria Eradication Special Account, based on voluntary contributions, has proved inadequate, and an alternative means had to be found. Several possible methods of financing the programme were therefore proposed to the Assembly by the Director-General.

After lengthy discussion, it was decided that, beginning with 1962, the administrative and operational services costs of the malaria eradication programme, including those of the Region of the Americas, will be financed from the regular WHO budget. The costs of the malaria eradication field programme will be incorporated in the regular budget by stages, i.e., $2 000 000 will be added to the effective working budget for 1962 to help finance this programme, and $4 000 000 for the same purpose will be included by the Director-General in his programme and budget estimates for 1963. In 1964 and future years, the full costs of the field programme will be included in the programme and budget estimates. A scheme of credits was adopted as a transitional measure to prevent this increase in the Organization's budget from being too heavy a burden on certain countries carrying out malaria eradication programmes.

In view of the incorporation of all malaria eradication activities in the regular budget,

[3] See page 201.

and its repercussions on the economy of Member States, the Assembly considered that it should be counterbalanced by a guarantee that the funds allocated to malaria eradication will be used in the most rational manner, in accordance with a programme based on the contributions voted. The Director-General was therefore asked " to prepare estimates of the trends in the activities of the Organization in respect of malaria for the coming five years, which will make it possible to visualize the future clearly ", and it was recommended that " in those countries whose programmes are making satisfactory progress and which have sufficient trained personnel, the possibility of reducing technical advisory assistance be studied by the respective Regional Committees for the benefit of those whose programmes have not yet started or are in their initial stages, as well as in order to make available equipment and supplies, particularly drugs, for use in the consolidation stages ".

As regards the Malaria Eradication Special Account, it was considered that voluntary contributions will remain essential to the success of the programme in order to provide additional resources for its broader and more rapid prosecution, as well as funds for the payment of credits. Member States, especially those that are more developed economically, were urged to consider making substantial voluntary contributions to the Account, in kind as well as in cash, and the Director-General was requested to continue his efforts to obtain contributions from other sources.

Smallpox eradication

The Assembly considered a report by the Director-General on the progress of the smallpox eradication programme. The report shows that appreciable progress was made in 1960 in intensifying efforts for the worldwide eradication of the disease. Eradication campaigns of varying intensity are now in operation in the endemic areas in Asia, Africa and South America. The total number of cases reported was 242 000 in 1958 (a year when the incidence of the disease was unusually high), and 75 000 in 1959. The number of cases reported in the first nine months of 1960 was 43 000.

In the Americas, the disease in endemic form is now confined principally to Brazil and Ecuador; Brazil has approved a national eradication plan and has started operations in a number of states. In the Eastern Mediterranean Region, Iraq has conducted a mass vaccination campaign, and Iran has completed the first phase of its eradication programme. Pakistan now has an eradication programme ready for execution and a pilot project is being started in the east of the country. Sudan has planned a 4-year eradication scheme. Ethiopia, Saudi Arabia and Yemen are all endeavouring to strengthen control measures.

The disease is highly endemic in South-East Asia. India has started a pilot project as a first step towards its eradication programme, a mass vaccination campaign is in progress in Pakistan, and Nepal has decided to set up a pilot control project. Thailand is launching a 3-year eradication programme in 1961. Burma's plan for an eradication campaign is being delayed pending the further development of the country's rural health services. Indonesia intends to intensify its control measures, particularly in the highly endemic areas of the country.

Smallpox has diminished substantially in the Western Pacific Region, so that most health authorities there find no need to develop eradication programmes. Malaya, which has had frequent outbreaks due to imported infection, has not as yet started an eradication programme.

During the three years 1958, 1959 and 1960, smallpox was imported into 30 countries, 18 of which were otherwise free from the disease. A stricter enforcement of the International Sanitary Regulations in regard to smallpox therefore seems called for in all countries.

The Assembly noted that progress has been made in the programme, particularly as regards the production of potent and stable vaccines, but also noted that the disease still presents an important problem in international travel and that it is therefore

desirable to speed up activities. The Assembly accordingly recommended that those countries which have not yet started eradication programmes should do so as soon as possible. It also urged the economically more advanced countries to make voluntary contributions in cash and in kind, so as to increase the funds for smallpox eradication in the WHO Voluntary Fund for Health Promotion.

Radiation health

The Director-General reported to the Assembly on radiation protection and control measures in Member States.[4] During the discussion that followed, one delegate said that alarm about the consequences of radiation has led to a reduction in the number of medical X-rays. This is not a trend to be deplored unless it leads to a state of affairs in which radiography that is urgently necessary is not being done. In Switzerland a survey has been carried out among physicians and in hospitals, and it has been found that more than 70% of X-ray examinations are of the chest, accounting only for 5% of the total gonad dose due to diagnostic radiology and less than 2% of natural background radioactivity. Diagnostic radiology of the abdomen, pelvic organs and lumbar spine accounts for over 15 milliroentgens per person per year—equivalent to about 20% of the amount received from natural background radioactivity.

The main theme of the discussion was the danger from the radioactive fall-out from nuclear explosions. The problem of protection from radiation can only be solved, it was held, if all its aspects are taken into account and radiation is reduced to the minimum. The resolution adopted by the Assembly accordingly approved the action of the United Nations General Assembly relating to the immediate cessation of nuclear testing, requested the governments concerned in the discussions on nuclear testing to give due regard to its health implications, and urged health authorities to keep representatives of their governments at those discussions fully up to date in regard to the deleterious health effects of radiation.

The resolution also called for the collection and dissemination to health authorities of scientific and technical information on the health aspects of radiation, and the sponsoring or stimulation of studies on the genetic and biological effects of low-level radiation from all sources. All Member States of WHO were requested to prohibit the discharge of radioactive waste into watercourses or the sea, to the extent that the safety of such discharge has not been proved. Research should be carried out into pollution of the sea and other international waterways by radioactive materials so as to establish acceptable standards and regulations to prevent their having adverse effects on man.

Membership of WHO

During the Assembly, the Islamic Republic of Mauritania was admitted to WHO as a full member, and Ruanda Urundi and Tanganyika were admitted as Associate Members. This brings the number of full Members of the Organization up to 105, and the number of Associate Members to 4.

As " fuller development of the activities of the Organization would be promoted by participation in the work of the Organization by additional States which are eligible but not represented in it ", the Assembly invited all such States to consider applying for membership in WHO.

Increase in membership of the Executive Board

Amendments to the Constitution of WHO that came into force last October have increased the membership of the WHO Executive Board from 18 to 24. The Assembly therefore had to elect 12 Members entitled to designate persons to serve on the Board, i.e., 6 to replace Members whose mandates had expired, and 6 to fill the new vacancies. The following were elected: Chile, Iceland, Iraq, Israel, Italy, Japan, Nigeria, Pakistan, Poland, Senegal, Spain and the United States of America. The other

[4] A summary of this report will be published in a forthcoming number of *WHO Chronicle*.

Members entitled to designate persons to serve on the Board are: Argentina, Ghana, Ireland, Jordan, Korea, Luxembourg, Nepal, Peru, Sudan, Thailand, the United Kingdom, and Venezuela.

WHO flag

The Assembly decided that the WHO flag to be flown on the premises of the Organization and elsewhere on ceremonial and other appropriate occasions shall consist of the official emblem of WHO centred on a blue background, with the Aesculapian staff and serpent in gold and the remainder of the emblem in white. The Director-General was asked to draw up regulations on the dimensions and proportions of the flag and on its use.

Fifteenth World Health Assembly

It was decided to hold the Fifteenth World Health Assembly in Switzerland.

DARLING FOUNDATION PRIZE

The Darling Foundation Medal and Prize are presented periodically for " outstanding achievements in the pathology, etiology, therapy, prophylaxis or control of malaria ". The award was created to honour the memory of Dr Samuel Taylor Darling, whose accidental death while on mission for the Malaria Commission of the League of Nations cut short a career devoted to research in the control of disease and particularly of malaria.

The first six awards were made to Colonel S. P. James (1932), Professor N. H. Swellengrebel (1937), Professor H. E. Shortt and Dr P. C. C. Garnham (1951), Dr G. Coatney and Professor G. Macdonald (1954), Dr P. F. Russell (1957), and Dr E. Pampana (1959). Meeting in October 1960, the Darling Foundation Committee unanimously decided that the seventh award should be made jointly to Sir Gordon Covell, of the United Kingdom, and Dr Arnoldo Gabaldón, of Venezuela.

At a plenary meeting of the Fourteenth World Health Assembly, the award was made by Dr Arcot Mudaliar, President of the Assembly, who gave the following outline of the careers of the recipients:

" Sir Gordon Covell's important contributions in malariology led, in 1936, to his being appointed Director of the Malaria Institute of India—a post which he held until 1947. During the Second World War his own battle against malaria was carried on vigorously and resulted in the saving of many lives in many theatres of operation. Afterwards, having reached an age at which many men retire, he became adviser on malaria to the British Ministry of Health and Director of the Malaria Reference Laboratory at Horton Hospital, Epsom, Surrey. His numerous writings include studies on the life history of malaria parasites and on the incidence, clinical aspects and ecology of malaria. He was a joint author of the valuable monograph on the chemotherapy of malaria which was published by WHO in 1955. But his greatest services to mankind may well be those that he has given as a teacher, an adviser and a director of research on malaria . . .

" Dr Gabaldón's magnificent services in the struggle against malaria are well known. As Director of the Division of Malariology at Maracay, Venezuela, he has guided large numbers of WHO fellows and other students, from all over the world, along the right path. He carried out, and described in the scientific press, a technically pioneering scheme of epidemiological study and executive control leading to the first declaration of eradication of malaria from a large area in the tropics. This alone is a pioneering activity of outstanding significance, but Dr Gabaldón has also contributed materially to general epidemiological understanding. His scientific knowledge, practical experience, far-seeing strategy, buoyant enthusiasm, dynamic energy and faith in the progress of public health have contributed enormously not only to the significant advances of malaria eradication in the Americas, but also to the general acceptance of the idea of world malaria eradication."

The award was then made to Sir Gordon Covell in person, and to Dr D. Castillo, delegate of Venezuela, who accepted it on behalf of Dr Gabaldón.

In his speech of acknowledgement, Sir Gordon Covell said:

" It gives me special pleasure to receive the award in the country where I spent thirty-three happy years of service, and in Delhi, which was my headquarters during the last ten years. But my greatest pleasure of all is to receive it in the presence of a number of my old friends and colleagues, most of whom were on the staff of the Malaria Institute of India at that time—that institute which is now the base of the gigantic malaria eradication programme now in progress."

Sir Gordon went on to speak of the important part this institute had played and was playing in the training of antimalaria personnel, not only for India but for other countries of South-East Asia. He then compared the present malaria situation in India with that of some twenty years ago when the only thing that could be done for the control of rural malaria was to try to provide sufficient drugs to treat the sick:

" We used to take our students, every time we held a course, to the Uttar Pradesh Terai . . . We took them there because we were able to demonstrate an area where malaria was so intense that great tracts of fertile country were left uncultivated. And now I am told that the whole of this valley is perfectly healthy and is being developed for agricultural purposes. Indeed, it is studded with prosperous farms. It has indeed become difficult, I think, for the Director of the Institute to find sufficient material for teaching his students."

Sir Gordon then gave a warning about the dangerous tendency to cut the budget for eradication programmes at the moment when the attack phase has reduced transmission to a very low level:

" . . . It is vitally important at this stage for the surveillance system to be functioning at its peak capacity, so that every remaining focus of malaria infection may be detected and dealt with. A cut in the malaria budget at this juncture, or failure to allocate funds to meet some special emergency, may well prove one more example of ' that ruinous economy which, by sparing a little, renders all that is spent useless '."

In conclusion, Sir Gordon paid a tribute to Colonel M. K. Afridi, Vice-Chancellor of Peshawar University and leader of the Pakistan delegation to the Assembly:

" It was directly due to the work of the organization which he built up that malaria ceased to be a problem of military importance among the Allied Forces . . . in South-East Asia . . . Except among those directly concerned, this great achievement has never been accorded the recognition it deserves."

Dr Castillo then read a message from Dr Gabaldón in which he said:

" I cannot conceal my pleasure at knowing that my colleagues on the Expert Committee on Malaria and the members of the Darling Foundation Committee consider me worthy of an award that is the highest honour to which a malariologist can aspire. It constitutes the culminating point in a life which has been full of satisfactions due to the continual retreat of malaria in my country as a result of the efforts made under my guidance by a group of men whom I have had the privilege of training and directing. Few men have had the good fortune during their lifetime to witness the transformation of their native country as I have seen mine transformed—so that whereas there were formerly large areas in which the population was decreasing because there were more deaths than births, the people's health has now improved so much, in relation to their general cultural level, that the population is increasing more rapidly than in any other country."

After paying a tribute to Sir Gordon Covell, Dr Gabaldón's message concluded:

" Finally, Mr President, permit me in accepting this Darling Foundation Medal and Prize to say that for me it has a special significance, for among all the malariologists who have received this honour I am the only one who has had an opportunity of combating the anopheline bearing the name of Samuel Taylor Darling, whose memory is honoured in the award that is being made today. This mosquito is the living symbol which will serve to remind future generations of this eminent man, and the Medal which is being presented to me today will be the symbol that I shall pass on to my children to remind them that in this life no effort is in vain."

RECENT ADVANCES IN TUBERCULOSIS CONTROL

Technical discussions at the Fourteenth World Health Assembly

Since 1951 it has been the custom at successive World Health Assemblies to hold technical discussions during the session, in which participants speak not as representatives of their governments but as members of their professions. These discussions, as the Seventh World Health Assembly recognized, " serve one of the most useful purposes of the Health Assembly, providing an opportunity for the growth and development of understanding of common problems ". The Tenth World Health Assembly specified that the subjects should be of international interest, general in character—and so suitable for discussion by public health administrators—and clearly defined.

The subject chosen for discussion at the Fourteenth World Health Assembly was " Recent Advances in Tuberculosis Control ".

The Chairman of the Technical Discussions at the Fourteenth World Health Assembly was Dr A. Sauter, Director, Swiss Federal Office of Public Health, Berne, Switzerland. Addressing the opening session, Dr Sauter pointed out that this was the first time that only one disease was being discussed and the first time too that the discussions were being confined to recent advances—this showing how radical were the changes that had taken place in the field of tuberculosis during the past few years. He went on to say:

" Historically speaking, of course, the discoveries which have led to these changes are not all of recent date. For example, BCG vaccination was not only known but had been already applied for decades in many parts of the world before it began, at the end of the Second World War, to be adopted on a very large scale, thanks to the international campaigns initiated in 1948 under the auspices of the United Nations Children's Emergency Fund (UNICEF) and the Scandinavian Red Cross Societies, and continued subsequently by UNICEF and the World Health Organization. The situation with regard to radiophotography is somewhat similar: technically speaking, the method was quite well developed some time before the war, but it was only in the post-war period that it attained its full importance in the mass campaigns which were then begun. Once again a phenomenon occurred not uncommon in medicine also (penicillin is a case in point): a discovery already perfected from the theoretical viewpoint had to await favourable extraneous conditions before being put to really effective use. Matters, however, are somewhat different with respect to chemoprophylaxis and chemotherapy in certain regions. In fact, it may be said that here the reverse process has occurred, for unfavourable circumstances, such as the lack of other means for the prevention and treatment of tuberculosis in such regions, rendered chemoprophylaxis and chemotherapy of paramount importance very soon after the discovery of certain drugs. This has led to the extraordinary situation that in countries where tuberculosis control is more or less in its infancy quite revolutionary methods are being adopted which other countries cannot follow without a great many reservations. This situation leads us to ask ourselves how far it is possible to hold joint discussions on the problems of tuberculosis in a forum as vast as the World Health Assembly.

" If it were merely a question of discussing solely the technical methods of combating tuberculosis, joint discussion would present no difficulties, even though various special problems may arise in connexion with technical procedures in different parts of the world. For example, there are particular aspects of the tuberculin test in regions where weak and probably non-specific reactions

frequently occur. However, for the health administrator the technical method in itself is only an instrument or tool and for him the conditions under which he can or must use this instrument are just as important as the method itself. It is obvious that a tool cannot render useful service if the object on which it is to be used is not suited to it. In this case, populations or population groups are the objects to which the methods of tuberculosis control must be applied; they all have their peculiarities, as regards both demographic structure and tuberculosis endemicity, and comparison between them is not possible. Furthermore, in the field of public health as in any other, a good tool is in itself not sufficient: there must be experts capable of using it, and, for their part, the experts cannot employ it unless certain conditions are fulfilled. In the field of public health, these conditions include appropriate legislation conferring the necessary powers on the authorities and the administrative bodies concerned, and making provision for the necessary credits, as well as other economic and social conditions.

" Let us first of all examine more closely those factors which determine in what way the technical means of combating tuberculosis should be employed. The demographic structure of the various peoples shows striking differences. Thus the proportion of the population in the different age groups varies within wide limits. For many reasons, demographic structure has important repercussions on tuberculosis epidemiology and consequently on tuberculosis control in a given country. We know that in those countries where the control of this disease has reached an advanced stage, tuberculosis mortality has not only fallen considerably but has moved towards the older age groups. Here, tuberculosis as a cause of death is assuming more and more the character of a disease of old age. We also know that in these countries the average age at which primary infection occurs is constantly increasing, that the average age of new active cases of tuberculosis may be 40 years or over and that the disease is becoming increasingly predominant among males. In these countries, unknown sources of infection, particularly important from the epidemiological viewpoint, are very often found among the aged, and cases of chronic bacillary tuberculosis are frequently seen among persons belonging to the asocial, psychopathic, alcoholic and homeless group, a group which confronts the health authorities with very special problems. On the other hand, we find many countries in which tuberculosis epidemiology is quite different, where primary infection usually occurs in childhood and there is a high incidence of new active cases and high mortality among young people.

" It is clear that in these circumstances there can be no scheme applicable to all countries so as to satisfy the general rule ... [that]... one of the main objectives of tuberculosis control is to find the infectious tuberculosis cases and render them non-infectious, but that, on the contrary, the application of case-finding and treatment techniques must be suitably adjusted to the particular situation. The tool, to return to the same image, may be the same, but it must be used in a different manner.

" It should be remembered in this connexion that nowadays it is often not enough for the health administrator to concern himself solely with tuberculosis epidemiology in his own country; he must also take certain migratory movements into consideration. Such migrations may occur within his country alone—in this case they are usually movements from the rural areas towards industrialized ones—but there are also migrations across the frontiers which must be borne in mind in many countries at the present time.

" On the epidemiological position depends not only the way in which each technique of prevention, case-finding, or treatment should be applied, but also the role which must be assigned to each of them in the tuberculosis programme as a whole and even in the general public health programme. Thus, the period of life during which BCG vaccination is most indicated is not everywhere the same. When incidence of primary infection is high in children, then young children will be systematically vaccinated; but the rarer primary infection in children becomes, the more im-

portant it will be to know in the case of each child the moment when conversion occurs, so as to be able to look for the source of infection. For this reason there will be a tendency not to vaccinate children until they leave school. In regions where the prevalence of the disease is on the low side, radiophotography is often, even usually, preceded by a tuberculin test and only tuberculin reactors are subjected to X-ray examination, whereas in other regions ... all persons above 15 years of age are radiographed. Recent investigations have confirmed that the radiation dose significant from the genetic viewpoint received by a population subjected to systematic radiophotographic examination of the lungs is very small. But nowadays the general rule adopted is that any exposure to radiation should be avoided when it is not actually indispensable. The more the prevalence of primary infection in childhood falls, the more possible it will become to observe this rule. On the other hand, it must give way to the requirements of tuberculosis control when primary infection is still frequent among children or adolescents. Thus the part to be played by a technique such as the tuberculin test, BCG vaccination, or radiophotography will vary according to the country, not only because it is applied to populations with a varying demographic structure and an accompanying variation in the epidemiology of the disease, but also because of a conflict between different public health requirements in general, these not being the same in all countries.

" Let us now turn to the factors which govern the extent to which the technical means of tuberculosis control can be applied. In the first place, mention must be made of the powers conferred by the constitution and the laws in force on the health authorities and administration, which often not only govern the activities of official bodies but also influence those of voluntary organizations which in many countries were the first to combat the disease and whose important role has rightly been recognized by the legislator. It is evident that here too the situation will vary from one country and region to another, since the tuberculosis control organization reflects not only the political structure but to some extent the history of any given country.

" Among the other factors on which the application of the available techniques depends we may cite the personnel specialized in this field. All health administrators know only too well the primordial importance of such personnel for the implementation of any health programme. Simplifying somewhat, it may be said that those regions where tuberculosis still poses the most serious problems are the same as those which suffer most from lack of specialized personnel. A fact complicating the situation is that it is not merely a question of having an adequate number of doctors and nurses available. Control of human tuberculosis is greatly dependent on the possibility of recruiting a sufficient number of X-ray technicians, medico-social workers, personnel for simultaneous control of bovine tuberculosis, etc. There seems to be a certain shortage of personnel almost everywhere. But this varies not only in extent but also in the basic reasons causing it. To give two extremes: on the one hand we have countries which so far have never been in a position to recruit and train the necessary specialists and, on the other, there are regions where the shortage of a certain type of specialist has arisen only recently because phthisiology is no longer of sufficient interest to doctors.

" Finally, there are the economic and social conditions. Formerly tuberculosis was termed a social disease with medical aspects. This definition, it is true, is no longer justified to the same extent as in the past, and nowadays we combat tuberculosis primarily as an infectious disease. With the technical means now at our disposal, an effective influence can be exerted on endemic tuberculosis, even under difficult economic conditions, and the great strides made in the control of the disease are due in large part to this new situation. However, what my teacher, Löffler, expressed in the following words, ' Money, when well employed, is an excellent remedy against tuberculosis ', still remains true. There is no need to explain at length here the necessity for adequate financing of tuberculosis programmes; nevertheless a point

which again illustrates existing differences should be mentioned. In the economically developed countries, the State contributes considerable sums for tuberculosis control and there is in addition a second source of money, reserved exclusively or largely for this purpose, namely, the private organizations, which often furnish a very appreciable part of the total available resources. In the economically weak countries, the State alone must defray all the costs.

" We feel that everything that has just been said suffices to show that it is justified . . . to ask oneself what common grounds there are for fruitful discussion, bearing in mind this extraordinary diversity of circumstances. It is all the more justifiable to ask this question in that, as has already been mentioned above, it is not primarily a matter of a discussion between specialists in particular technical fields, such as bacteriologists, immunologists, radiologists, or tuberculosis clinicians, but, above all, of an exchange of views between public health experts whose work is governed by all the factors whose great variety we have tried to outline. We must ask ourselves, in fact, what features of tuberculosis are of common interest to us all. The most obvious answer seems to me to be that tuberculosis still represents for all countries, even those which are already considering the possibility of its eradication, a serious public health problem, which, following a change in external conditions, could always and everywhere again become an urgent one. Moreover, there is hardly any country which, at the present time, does not see itself obliged to reconsider its tuberculosis programme. This seems to be the most important common denominator of our discussions. The reasons for such a reconsideration are evidently not the same everywhere—on the contrary, they are very varied. This is clearly shown by recent publications which have appeared in the *Bulletin of the World Health Organization*, some of them dealing with the epidemiological basis for tuberculosis eradication in one country, while others discuss the problems arising in another still at the commencement of the struggle. But in the light of recent experiments certain comparisons are possible, as well as discussions to which all countries can contribute. This applies in particular to the relatively young fields of chemoprophylaxis and chemotherapy, to which the World Health Organization has paid great attention for years . . .

" The history of tuberculosis control shows that during decades treatment of a tuberculous patient according to the recognized rules meant his hospitalization. This position was not changed when the first specific antituberculosis drugs appeared. On the contrary, their use involved difficulties constituting still another reason in favour of hospitalization. When, after the Second World War, tuberculosis control was intensified, the first concern of the health administrations in most countries was to provide a sufficient number of hospital beds. Thus the points of departure for discussion of the question of hospital versus domiciliary treatment are diametrically opposite for countries with an adequate or even too high number of beds as opposed to those where hospitalization of the majority of the tuberculous is quite impracticable. For the health administrator in the latter countries, the question of hospital or domiciliary treatment is therefore largely theoretical in nature. On the other hand, in the industrialized countries there are reasons which straightaway exclude a large number of patients from domiciliary treatment, such as difficult housing conditions and the impossibility of finding qualified nursing staff. But behind these practical realities which for the time being largely determine the action taken, there are questions of principle which persons responsible for public health must ask themselves. What will be the effect of the new methods of prophylaxis and treatment on epidemiology? Is there a risk that bacterial resistance will not remain merely a question of individual medicine but will become an important epidemiological problem? Has the need to increase the number of hospital beds merely been postponed? What can be said regarding the domiciliary treatment—in all countries—of that group of patients who still today present a difficult problem, even in countries where tuberculosis control is in an advanced stage, i.e., the asocial, homeless,

etc.? Finally, what will be the consequences for the structure and functioning of tuberculosis services as a whole? Will the health authorities still be sufficiently in touch with tuberculosis cases treated at home to enable doctors and medico-social personnel to carry out the epidemiological investigations which are essential if the source of infection of the patient is to be found, on the one hand, and the persons infected by him, on the other? Will a change in the legislation, for example, in that governing case notification, be necessary?

" Thus we find that recent advances have indeed created fresh possibilities and improved the prospects of effective control, this applying also to those countries which have only recently engaged in systematic control measures or have still to do so, and which, in relation to the extent of the task, have so far only very limited resources at their disposal. But at the same time these advances have given rise to many new problems, some common to all countries and others of importance only to some of them, depending on the status of the endemic and the progress made by tuberculosis control. Each country must find the solution best fitted to it. As was said in a WHO document two years ago: ' Tuberculosis is a community problem. Tuberculosis control must, therefore, be considered in relation to other problems in the community, and it must be planned in conjunction with, and organized as a part of, the general public health programme for the community, and not merely as a part of the curative and clinical services provided for the community.' "

* * *

After the opening session the 133 participants divided into five groups, each containing representatives from 20-25 different countries.[1] An even geographical distribution was observed in each group in order to allow exchanges of views about situations in widely different parts of the world. The groups had before them as a background document a report on the comments received from Member States about a " suggested outline " for the discussions circulated to stimulate discussions at the national level; as well as the reports of a WHO Seminar on Tuberculosis organized in Sydney by the Regional Office for the Western Pacific, of the technical discussions held by the WHO Regional Committee for the Eastern Mediterranean on " Tuberculosis control with special reference to domiciliary treatment ", and of several meetings of technical committees of the International Union against Tuberculosis. The conclusions of the five groups are summarized below.

[1] The chairmen of the groups were: Dr P. V. Benjamin (India); Dr J. S. Sodhy (Malaya); Dr C. M. Norman-Williams (Nigeria); Dr A. R. Farah (Tunisia); and Dr J. E. Perkins (USA).

General considerations

Very little reference was made by any country in its comments on the suggested outline for the discussions to the ultimate objective of tuberculosis control—the eradication of tuberculosis. On the other hand, there was some discussion of the definition of when tuberculosis ceases to be a public health problem. A WHO Expert Committee on Tuberculosis had stated that " the elimination of the disease as a public health problem could not be considered to have been achieved in most instances until the prevalence of natural reactors to tuberculin among children in the 14-year age group had become less than 1% (a natural reactor being defined as a person showing a significant reaction to a standard dose of tuberculin) ".[2] To some countries, for example India, this standard is not acceptable because of the prevalence of non-specific tuberculin sensitivity. It was recommended that under these conditions a search be made for some other appropriate index.

In practically all countries the tuberculosis control programme seems to be established on a nation-wide basis. It is universally recognized that the main objective of this control programme is to find the infectious persons (and animals) and render them non-infectious. Whether the case-finding survey commences with community-wide tuberculin

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1960, **195**, 13.

testing or with mass photofluorography [3] of the chest depends very largely on the prevalence of infection and the age groups to be included. Tuberculin testing is considered valuable in dividing the members of the population into those who are probably not infected and those who almost certainly are infected. Photofluorography of the chest serves to screen out those who have evidence of " pulmonary pathology ". Bacteriological examination will determine who has infectious tuberculosis.

The ability of BCG vaccination to increase the immunity of the uninfected members of a community is widely recognized. In areas with a high prevalence of infection it can be used on a mass scale for selected age groups, and where the prevalence is low it is valuable for the protection of those who are " living and working at risk ".

The highly effective antituberculosis drugs play a valuable part in prophylaxis as well as in therapy. While primary chemoprophylaxis [4] has a very limited place in the control programme, secondary chemoprophylaxis [5] is considered of value in preventing dissemination of the disease or its development in persons who are already infected.

The introduction of effective drugs has made the treatment of individual patients one of the most important health measures in the control of tuberculosis. By preventing non-infectious disease from becoming infectious and by rendering infectious cases of tuberculosis non-infectious, the antituberculosis drugs considerably reduce the public health problem. Whether the tuberculous patient is treated in hospital (sanatorium) or on a domiciliary or ambulatory basis depends largely on local conditions.

In the economically less developed countries much of the treatment will have to be given on a domiciliary or ambulatory basis. In them as in the more developed countries inexpensive hostels will have to be provided for some of the patients who do not respond to modern treatment and who remain infectious.

In the economically more developed countries also, much of the treatment will be given on a domiciliary basis. This mode of treatment will be used mainly for patients who have already had an initial period of treatment in hospital. Chemotherapy, to be successful, must be in adequate doses and carried on continuously for long periods. Frequently hospitalization during the whole period of treatment is not feasible, and the drugs will then have to be self-administered. Under these circumstances supervision by specially trained home visitors is essential; so is intensive health education to ensure the fullest co-operation of patients and their families.

It appears to be widely recognized that a tuberculosis control programme should be carefully planned and implemented as the necessary trained staff and equipment become available. It should form part of the general public health service of a country. Case-finding should be followed by effective treatment and " disposal ". At regular intervals the control programme should be reviewed so that its methodology can be evaluated. Assessment of progress may be greatly aided by the keeping of " live " case registers, i.e., registers constantly kept up to date.

By integration of tuberculosis control into the general public health services duplication of personnel and of effort is avoided and expenditure reduced. In planning control measures their financial implications must be related to the cost of the whole public health service. The extent to which the plans can be implemented depends on the availability of trained personnel, funds and equipment.

As an infectious disease concerns the entire community and not only the individual patient, the success of a control programme will, to a very large extent, depend on the ready co-operation of the members of the public among whom the control measures are to operate. Health education of the public therefore plays a decisive role as it promotes

[3] Also called mass miniature radiography, radiophotography, R. P., etc.

[4] Primary chemoprophylaxis is usually defined as the administration of one or more antituberculosis drugs to a person who is not infected with tubercle bacilli (i.e., who does not react to the tuberculin test), the aim being to prevent infection (infection chemoprophylaxis).

[5] By secondary chemoprophylaxis is generally meant the use of one or more antituberculosis drugs to prevent the development of disease in a person who is already infected with tubercle bacilli, as evidenced by a positive reaction to the tuberculin test (disease chemoprophylaxis).

a high level of health consciousness and thus ensures a high participation rate by the population in recommended control measures.

Epidemiology of tuberculosis

In some of the more developed countries the epidemiological pattern has changed during the last few years and the disease is no longer epidemic but endemic. Socio-economic conditions are considered to have a very definite but slow-acting effect on the prevalence of tuberculosis. In most countries, especially in the higher age groups, males are found to be more frequently diseased than females. Also, the disease is not always more prevalent in the urban than in the rural areas.

While the study of mortality and morbidity rates is valuable, their usefulness can be increased when they are associated with the information gained from surveys which include tuberculin skin testing, mass photofluorography and bacteriological examination. Subjects who are found to be infectious or potentially infectious should immediately commence treatment, and their contacts should be fully investigated.

Case-finding

The three diagnostic procedures just mentioned—the tuberculin test, photofluorography of the chest, and bacteriological examination—are important in all case-finding programmes, which, of course, should be conducted on a community-wide scale. In some areas, however, X-ray examination is not available and reliance has to be placed on tuberculin testing and sputum examination.

The prevalence of infection in an area determines, to a large degree, the order in which these examinations should be carried out. In high prevalence areas all members of the community above the age of 15 years should have their chests X-rayed. In low prevalence areas the photofluorographic examinations are preceded by tuberculin testing and only those who react to the test have their chests X-rayed. Thorough investigation, including bacteriology, must follow the finding of any evidence of significant " pulmonary pathology ".

Tuberculin testing

WHO has drawn up standards for the intradermal tuberculin test—the product it advises to be used (RT 23 with Tween 80), its dose, the technique of injection, and the method of reading and recording the test. In some parts of the world, particularly in tropical countries, some difficulties are being experienced in interpreting the results of this test. It would appear that the dose used will have to be varied to suit local conditions.

When the tuberculin test is used to separate the infected from the non-infected members of a community—for example, before BCG vaccination or photofluorography—many countries find a percutaneous method, such as the multipuncture test, to be satisfactory. This method of testing is growing in popularity. However, the intradermal Mantoux test, using a standardized tuberculin, is the most widely employed method and appears to be a most efficient single test. It certainly is the most valuable test where non-specific sensitivity is being investigated.

The question how the reactions to a low-dose intradermal test should be interpreted was discussed by a WHO Expert Committee on Tuberculosis in 1959. The Committee held that " in areas where small reactions are infrequent [i.e., where there is probably little or no non-specific sensitivity to tuberculin], the criterion for a ' tuberculin reactor ' recommended in its sixth report—namely, a reaction of 5 mm or more in diameter—may still be used to separate the tuberculous infected from the non-infected . . . However, with regard to areas where small reactions are common [probably indicating the presence of non-specific infections producing reactions to the tuberculin test] it can only be stated (1) that a reaction of less than 5 mm indicates in all probability that the person is *not* infected with *Myco. tuberculosis*; (2) that a reaction of 10 mm or more indicates in all probability that the person *is* so infected; and (3) that a reaction measuring 5-9 mm in-

dicates that the person may or may not be infected . . .".[6]

As regards the use of the low-dose intradermal test for determining who should be excluded from BCG vaccination, it has been proposed by the WHO Expert Committee that " in an area in which reactions of less than 5 mm are common—probably indicating the presence of non-specific infections producing reactions to the tuberculin test—the criterion for a 'positive' reaction might be set at 10 mm or more . . .".[6] The effect of this naturally acquired low-grade tuberculin sensitivity on the efficacy of BCG vaccination is being studied in several areas.

Much useful information regarding the tuberculosis problem in a country or even in different population groups can be gained from tuberculin surveys of different age groups, particularly of children. The percentage of reactors among the toddlers, the school entrants and the school-leavers provides a most valuable index to public health administrators and might even be used for international comparisons.

In some developing countries complicated surveys are not possible, and reliance might have to be placed on this simple method of tuberculin testing of schoolchildren and of pre-school children. In fact, in some areas of very high prevalence where funds and facilities are very limited, reliance has had to be placed on tuberculin testing and sputum examinations. Those who do not react to the tuberculin test are vaccinated with BCG, and those found infected are given treatment.

Photofluorography of the chest

The value of photofluorography in a case-finding programme is appreciated by all countries trying to bring tuberculosis under control. It is regarded as the most practicable method leading to the detection of tuberculosis amongst the apparently healthy members of a community.

The frequency with which community surveys should be repeated in the same area varies from country to country. Usually the interval is three years, but it may be as long as five years, and sometimes these surveys are performed annually. In areas where the prevalence of tuberculosis is low, repeated mass X-ray case-finding is considered uneconomical. It is in these areas that preliminary tuberculin skin testing should be employed if at all practicable.

In low-prevalence areas the X-ray case-finding programmes are becoming more selective, i.e., they are confined to certain groups. These groups may be broadly divided into: (i) high-prevalence groups (contacts of known cases of tuberculosis, patients referred by their medical attendants, hospital patients); (ii) high-risk groups (persons exposed to more than average risk of infection, e.g., staffs of hospitals, sanatoria, clinics, laboratories); and (iii) danger groups (i.e., persons who by virtue of their occupation may constitute a special danger to others should they have infectious tuberculosis —teachers, children's nurses, food handlers, hairdressers, staff of public transport, etc.).

Young children and pregnant women are usually excluded from mass or community X-ray programmes. In most countries children below the age of 15 years do not have their chests X-rayed unless they are reactors to a tuberculin skin test, and then only if the reaction is large or they are contacts of known cases of tuberculosis.

While technicians can be trained during a relatively short course of instruction to operate photofluorographic equipment under the supervision of qualified radiographers, it is not considered advisable to use them for the reading of films except under very special circumstances. They can be taught how to divide the films into " normal " and " probably abnormal ". The final classification should be made by medically trained personnel—radiologists or chest physicians or both. Dual independent reading is advised but rarely practised.

The finding of radiological evidence of " pulmonary pathology " is usually, though not invariably, followed by complete investigation, including bacteriology, before the diagnosis of tuberculosis is made. Even when there is no bacteriological proof that tuberculosis is the cause of such " pulmonary pathology ", those concerned should be kept

[6] *Wld Hlth Org. techn. Rep. Ser.*, 1960, 195, 7.

under observation. There is much support for giving chemotherapy to the positive reactors to the tuberculin test among this group of people.

Radiation hazards to the technical staff, as well as to the members of the population being examined, have been closely studied during recent years. The measures required for the protection of the staff and of the public are well known and generally adopted. These measures include careful location and alignment of equipment, adequate tube-housing and shielding, optimum kilovoltage, the use of aluminium filters, fast films and fast screens, restriction of the beam to the smallest reasonable field, conversion to the mirror-optics system, the use of gonad drapes and the correct use of protective screens. Care must be taken that persons awaiting their turn for examination are not allowed to wait near the X-ray apparatus.

The benefits from photofluorography properly applied far outweigh the infinitesimal dangers of radiation in this examination.

It is agreed that fluoroscopy should no longer be employed in mass case-finding, and that its use should be limited to certain forms of investigation, e.g., the routine check-up of cases receiving collapse therapy or bronchography.

Bacteriological examination

Direct microscopic examination of the sputum is used by all countries, but it is only in some areas that there are facilities for concentration, culture, or animal inoculation. Specimens of sputum are obtained either by the voluntary cough method or by swabbing the larynx. It has been found that the early morning specimen is the best for examination.

Owing to the growth of contaminants, transportation of sputum presents some difficulties. The addition of malachite green, tri-sodium phosphate or Désog ne has been found satisfactory in reducing the growth of most contaminants.

Relatively little is known about the epidemiology of atypical mycobacteria, of which about a hundred strains have been identified. Nor is a great deal known about their clinical importance. Infection with these organisms has been reported to produce sensitivity to mammalian tuberculin and thus to be a source of some of the non-specific reactions to the tuberculin skin test. It is thought also that such an infection might interfere with the effect of BCG vaccination.

Selected problems, such as the identification of atypical strains and their geographical distribution, are the subject of co-operative studies conducted under the auspices of WHO. While the problem of the role of atypical mycobacteria is of great scientific and epidemiological interest, it has been pointed out that it should not throw any doubt on the value of the classical methods of diagnosis and treatment of tuberculosis.

Tuberculosis in domestic animals

While admittedly not infallible, tuberculin testing is the most reliable method of detecting infection with the tubercle bacillus in animals as in man. If tuberculosis is to be brought under control in and eventually eradicated from man, it must be eradicated from those animals which might be sources of infection in man. This has already been achieved in some countries, but in others the bovine strain of bacillus is still the cause of tuberculosis in many human subjects.

The development of a more specific test for domestic animals would ensure large financial savings, since the destruction of cattle reacting non-specifically to the present tests but with no detectable tuberculosis at autopsy could perhaps be avoided.

Bovine infection having been eliminated from the cattle of some countries, efforts continue to be made to prevent the spread of tuberculous infection from human beings to cattle.

Prevention

BCG vaccination

The tuberculin skin test enables a division to be made of the members of a community into those who are probably already infected with tubercle bacilli and those who are unlikely to be infected. In order to increase the resistance of the uninfected group,

vaccination with BCG should be used. The value of this preventive measure is widely recognized, and it has a high priority in most programmes for the control of tuberculosis. Some countries continue to use BCG because of the marked reduction, in fact almost total disappearance, of tuberculous meningitis and miliary disease from successfully vaccinated infants.

In several countries the oral method of vaccination is used especially for infants, but intracutaneous or percutaneous methods are in more general use. For oral vaccination large doses of vaccine have to be given and so it is more expensive than the other methods. On the other hand the vaccination of the new-born by the intracutaneous method is difficult, and complications are more frequent than in other age groups.

Although the value of BCG vaccination in a tuberculosis control programme is widely recognized, it must be remembered that it is a supplement to and not a substitute for other recognized control measures. In low-prevalence areas, especially where the infection rate is falling, there is no justification for mass BCG vaccination. Under these circumstances its use should be confined to those who are living and working " at risk ". By delaying the giving of BCG vaccine till school-leaving age, the diagnostic value of the tuberculin skin test can be preserved till the age of 13 or 14 years. In areas where the prevalence is high, there is very strong support for its mass use for the new-born, especially in maternity hospitals, and for school entrants and school leavers.

Owing to the frequent movement of people from low-prevalence areas to areas of high prevalence where the risk of infection is relatively great, it is suggested that non-reactors to tuberculin skin testing be vaccinated with BCG vaccine at least three months before they undertake such a journey.

The value of, and need for, revaccination appear to depend on local conditions. In some countries where the oral method is used, revaccination is done several times up to 20 years of age. In many tropical countries it has been found that post-vaccination skin hypersensitivity is appreciably lower than that following natural infection. This observation has increased in importance since the introduction of the " international " batch of purified tuberculin RT 23 with Tween 80. The use of between 2 TU and 3 TU instead of the currently recommended dose of 1 TU of this product is under trial.

Some countries have found freeze-dried (lyophilized) BCG more suitable to their local conditions than liquid vaccine. The " protective " immunizing property of this product is still under investigation. If satisfactory, the freeze-dried product would certainly lessen the problems of storage and transportation. It is generally agreed that BCG vaccination should be preceded by tuberculin testing and only non-reactors vaccinated. Further, the majority of countries prefer not to carry out BCG vaccination at the same time as vaccination against smallpox. Even so, in some areas both vaccinations have been performed during one visit without unpleasant complications.

Chemoprophylaxis

Primary chemoprophylaxis, i.e., the administration of antituberculosis drugs to prevent infection in those not already infected, has not been practised to any large extent. It is however used under very special circumstances, as, for instance, when new-born and young children have to remain in close contact with tuberculous parents and the use of BCG vaccination is not practicable. The value of this form of " prevention of infection " is being investigated in several large well-controlled studies. The present opinion is that primary chemoprophylaxis should not replace BCG vaccination.

Secondary chemoprophylaxis is generally defined as the use of antituberculosis drugs to prevent the development of disease in persons already infected. It is the infection that is being treated, as opposed to the treatment of the developed disease by chemotherapy.

By reducing the dissemination of infection and so partly or wholly preventing its development into an active disease process, or by diminishing the likelihood of re-activation of old infections, this form of chemoprophylaxis

has a definite place in many control programmes.

There is general agreement that it should be used for young infected children. The upper age-limit varies from country to country. Its value in primary tuberculosis in children has been demonstrated in a controlled trial. A daily dose of isoniazid was shown to prevent nearly all extra-pulmonary complications such as bone and joint disease and tuberculosis of the kidneys and of the meninges.

Contacts of infectious patients who are reactors to the tuberculin test are given chemoprophylaxis in many countries. It is also being used for adolescents and young adults who show marked hypersensitivity to the tuberculin test. Some countries are waiting for further evidence of the preventive value of disease chemoprophylaxis.

Chemotherapy

Treatment with the three most commonly used antimicrobial drugs (i.e., isoniazid, para-aminosalicyclic acid, and streptomycin) must be prolonged, uninterrupted, and given in adequate doses and in the correct manner. A combination of at least two drugs is required during the infectious stage. Whether isoniazid is effective in the non-infectious stages of tuberculous disease has not been finally decided. Nor is there general acceptance of the view that three drugs are more effective than two.

Drug resistance in relation to both the individual patient and the community presents a double problem. Reduction in the therapeutic effectiveness of the drugs in the case of an individual patient is important, but not nearly so important as the spread of drug-resistant mycobacteria in a community. So far such organisms have only rarely been isolated from primary infections in children. These bacilli however do cause some public health hazard, but at present that hazard does not appear to be great. The question of whether chronic excretors of isoniazid-resistant mycobacteria cause a public health problem has not been sufficiently studied for an opinion to be possible. In many countries the whole question of drug resistance is under review.

Non-institutional treatment

The importance of domiciliary and ambulatory treatment in tuberculosis control is now widely recognized. Because in the economically less developed countries there are very limited hospital resources, this form of treatment has to be used for the great majority of patients. It is also being used more and more in the more economically favoured countries for the long-term continuation of hospital treatment.

Where hospital beds are available, newly discovered infectious patients should be admitted at least for a short time, during which they are fully investigated, the correct treatment is started, and the patient and his family are educated concerning the disease. When the patient has ceased to be infectious, transfer to ambulatory care may be arranged. Patients who are acutely ill, those with tension pneumothorax, large pleural effusion, or haemoptysis, and those requiring surgical treatment will need hospital care.

If treatment can be given on an ambulatory basis very few problems arise. Patients can attend out-patient departments of hospitals, dispensaries, or clinics and rural or other health centres for their daily treatment when necessary, and their behaviour and progress can be easily supervised. The condition of the homes, the possibility of isolation, the presence of young children and adolescents in the home, and the availability of transport are of paramount importance.

For adequate follow-up services it is necessary to train a special class of home visitors or " aides ", because it is impossible to provide enough professional public health nurses. It is essential to have the assistance of local lay persons of standing in the rural community to help with home visiting and follow up.

For chemotherapy in the home to be successful, the drug or drugs prescribed must be acceptable to the patients; otherwise they are taken irregularly and for too short a time. Frequent change of address provides a very great problem. However, where satisfactory supervision is available the patients do take their drugs quite regularly. It has been found

that the regularity with which drugs are collected and taken is proportionate to the amount of supervision given.

The incidence of infection among the contacts of patients treated on a domiciliary basis has not yet been very extensively studied. Also, few comparisons have been made between the relapse rates of patients treated in hospital for a period and those whose whole treatment has been non-institutional. The ability to give to patients and their dependants financial assistance, or assistance " in kind ", is very important.

Organization of tuberculosis control programmes

Assessment of the tuberculosis problem

Reliable data indicating the extent of the problem are rarely available in those countries where the need to organize a tuberculosis control programme is greatest. Morbidity and mortality rates are not accurately recorded and so a prevalence survey becomes necessary.

For international comparison the prevalence of persons excreting tubercle bacilli is regarded as the most reliable index, as it is for local use as well. Whether the prevalence of significant shadows in chest X-ray films or of natural reactors to tuberculin skin tests is the more important as a second index has not been decided.

It has been recommended that future prevalence surveys should include all three diagnostic procedures: tuberculin testing, photofluorography, and bacteriological examination of the sputum of those who show radiological evidence of pulmonary pathology and are reactors to the tuberculin test. The results of these prevalence surveys should be based on a complete follow up, and such surveys should, in the first instance, be conducted in and around the larger centres of population and form part of so-called national pilot area projects. These should include the training of national personnel, health education of the public, case-finding and treatment, and such preventive measures as BCG vaccination and chemoprophylaxis.

Case registers

Notification of cases of tuberculosis should be compulsory, and the maintenance of a " live " case register is essential for the operation of an effective tuberculosis control programme.

The role of the hospital

This has been described in a previous section. In addition to those already mentioned, many patients suffering from extrapulmonary disease such as tuberculous meningitis, tuberculous bone and joint disease, etc. may be unsuitable for domiciliary treatment.

Social assistance and rehabilitation

In most countries some form of social assistance is available to tuberculous patients or their families or both. It is recognized that special aid is necessary for the aged and the indigent. If patients are breadwinners for the family, the provision of a special pension does much to remove financial anxiety while they undergo treatment.

Social assistance to the patient and his family is provided either directly from government sources or by voluntary agencies. It is in this sphere that the medico-social worker is so very valuable. The role of voluntary agencies in a tuberculosis control programme is most important, and they should work in close co-operation with government departments.

Rehabilitation of the tuberculous ex-patient is not as difficult as it used to be, except for those aged 50 years and over, especially if they are unskilled. Psychological rehabilitation remains a very important factor.

Integration of services

In practically every country it is agreed that the tuberculosis control division should be so planned as to be an integral part of the public health service.

Because of the increasing need for the supervision of domiciliary care and the follow up of ex-hospital patients, the work of public health nurses and nursing aides and of public health inspectors becomes essential if control is to be effective.

The importance of research into the control of tuberculosis must not be forgotten and must receive adequate financial support.

Health education

If the plan to control tuberculosis and eventually to eradicate it is to succeed, there must be the fullest co-operation between members of the public, members of the medical profession and its ancillary branches, the public health services, and politicians.

In some countries health education is largely the responsibility of special " health educators " who operate in both official and voluntary agencies. It is especially important not to neglect the valuable part that can be played by private initiative and by voluntary bodies. Health education, at the official level, is the concern of several ministries, including those of health, education and agriculture.

Mass surveys connected with tuberculin testing, BCG vaccination, and photofluorography are excellent opportunities for extensive health propaganda, and it should always be remembered that " a successful tuberculosis control programme is its own best advertisement ".

COR PULMONALE

Our present information about the frequency of chronic pulmonary heart disease is sketchy and inadequate. The condition is not listed as such in the International Classification of Diseases, but is allocated to the category of unspecified heart disease; and what information we have is largely derived from statistics of hospital admissions and autopsies, different sources providing very different figures. Most workers agree, however, that over half the cases are the outcome of chronic bronchitis, asthma or emphysema. Cor pulmonale is a progressive and fatal disease, but its importance as a cause of chronic ill health has been insufficiently recognized. The recently published report [1] of a WHO Expert Committee on Chronic Cor Pulmonale [2] points out that it is only lately that accurate physiological and clinical methods for its study and diagnosis have been worked out. If these can be generally applied, and wide agreement reached on definitions and measurement, this will help in determining whether local variations in incidence are genuine and, if so, whether they reflect important social and environmental differences. It will aid, further, in the application of effective modern forms of treatment which may give sufferers years of useful life.

Definition and classification

Cor pulmonale was defined by the Committee as " hypertrophy of the right ventricle resulting from diseases affecting the function and/or structure of the lung, except when these pulmonary alterations are the result of diseases that primarily affect the left side of the heart or of congenital heart disease ". Such a pathological definition is preferable to one in terms of increased pulmonary vascular resistance, which is notoriously variable and difficult to measure. The lung diseases responsible may be either those affecting respiratory function or those affecting the pulmonary blood vessels, the two groups differing in their clinical manifestations. In the first group the primary lung disease causes most of the symptoms, and cardiac involvement is secondary to respiratory failure; disturbances of respiratory function and of pulmonary vascular resistance coexist. In the second group symptoms are diverse, and heart failure develops while respiratory function is still not much impaired; disturbance of vascular resistance in

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1961, 213.

[2] Members of the Committee: Dr J. Dankmeijer, Netherlands; Dr F. Herles, Czechoslovakia; Dr M. Ibrahim, Province of Egypt, United Arab Republic; Dr D. D. Reid, United Kingdom; Dr D. W. Richards, USA (Chairman); Dr C. H. Stuart-Harris, United Kingdom (Rapporteur); Professeur A. C. Taquini, Argentina; Dr L. Werkö, Sweden (Vice-Chairman). Secretariat: Dr M. Čakrtová, WHO; Professor H. Denolin, Belgium (Consultant); Dr Z. Fejfar, WHO (Secretary); Dr C. M. Fletcher, United Kingdom (Consultant); Dr A. Kagan, WHO; Dr L. Verhoestraete, WHO.

the lung fields predominates. The two groups may be broadly classified as follows:

1. *Diseases affecting respiratory function*

(*a*) Diseases of the air-passages and alveoli: chronic bronchitis, asthma and emphysema; pulmonary fibrosis, including the pneumoconioses and other forms of occupational fibrosis; pulmonary granulomata and infiltrations such as sarcoidosis and parasitic disease.

(*b*) Diseases affecting thoracic movements: deformities such as kyphosocoliosis; the results of surgical procedures or of paralysis of respiratory muscles.

2. *Diseases of the pulmonary vessels*

These include primary diseases of the arterial wall—the various forms of arteritis; thrombo-embolic disorders; and pressure on the main vessels by mediastinal tumours or fibrosis.

Diagnosis

The recognition of cor pulmonale rests on clinical, radiological, electrocardiographic and haemodynamic evidence. Basically, it lies in demonstrating the existence of right ventricular hypertrophy in the presence of one of the causative diseases already mentioned; yet such hypertrophy may not be easily appreciated in life even when autopsy reveals considerable changes in the ventricle. The cardiac signs may be masked by distension of the overlying lung. The radiological evidence is also inconstant, and enlargement of the ventricular shadow may indicate dilatation rather than hypertrophy; but it is common, and typical, to find the stem and main branches of the pulmonary artery dilated in contrast to the diminished vascular shadows at the periphery. The electrocardiogram, which sometimes remains persistently normal despite obvious pathological changes in the heart, commonly exhibits groups of associated disturbances which are acceptable as highly suggestive or conclusive evidence. Finally, while the haemodynamic findings provide the most direct and accurate proof of pulmonary hypertension, cardiac catheterization should be necessary in only few cases and should be performed only by competent workers under good conditions.

Chronic bronchitis and emphysema

This group of disorders, the most important numerically in etiology, is marked by alveolar hypoventilation. Right ventricle hypertrophy is not a manifest feature, as it is overlaid by the earlier and more obvious features in the lungs. These diseases are characterized clinically by cough, dyspnoea of effort, and wheezing. The physical signs and radiological changes in the lungs are typical and easy to detect, and the disturbances of respiratory function and gas-interchange are demonstrable by spirometry and analysis of arterial gases. In the natural history of this group there is a long introductory phase when there is no evidence of cardiac involvement, but cough and expectoration appear as the main symptoms. This is followed by a stage of breathlessness on exertion, with or without intermittent respiratory infections; these are sometimes severe and cause extreme cyanosis, hypoxia and hypercapnia. The final stage is one of congestive heart failure of sudden or insidious onset, with dilatation of the heart that eventually persists and with increasingly abnormal electrocardiographic findings. In this type of heart failure the severe cyanosis, the polycythaemia, and the disorientation and other neurological disturbances are in contrast to the features of right heart failure of rheumatic or ischaemic origin, and the clinical recognition of cor pulmonale is made with much more certainty during this final phase. The general picture is somewhat different in the other class of primary lung disorders responsible for cor pulmonale, i.e., severe pulmonary fibrosis or granulomatosis. Here there is a steadily progressive and disabling dyspnoea. Many patients die without ever having developed cardiac failure at all, and when this does occur it is not very responsive to treatment. Finally, hypoxia is not characteristic of the earlier stages here and hypercapnia rarely occurs.

Cor pulmonale secondary to vascular disease

Here the essential underlying change is a widespread narrowing or actual occlusion of the pulmonary vessels. There is an increased resistance to the blood flow and an increased

load on the right heart. Right ventricular hypertrophy is early and manifest, and its clinical recognition much easier than in other types of cor pulmonale because the cardiac signs are not obscured by changes in the overlying lungs. In severe pulmonary hypertension of this type—as may be seen, for instance, in occlusion due to bilharziasis—symptoms are usually absent for months or years until the onset of abrupt dyspnoea and syncope, even unconsciousness, on exertion. Cyanosis is not regularly present, the blood pressure is low, and hypoxia is unusual. The radiological evidence of dilatation of the main pulmonary artery stem and branches is greater than in any other type of cor pulmonale, and patients do not necessarily develop any impairment of respiratory function. Similar patterns are seen in the other disorders included in this group of primary vascular diseases, such as multiple thrombotic or neoplastic embolism and vascular lesions forming part of a generalized disturbance such as polyarteritis or lupus erythematosus. Whether a condition of primary functional pulmonary hypertension without obvious anatomical changes exists at all as a genuine entity is still a matter of dispute.

Treatment

In many cases the treatment of the causative disease is already either well defined or acknowledged to be ineffective. The prompt antibiotic management of respiratory infections is essential to forestall the onset of cardiac failure. In the important group of cases due to chronic bronchitis the patient should stop smoking and avoid irritating climatic and industrial conditions of smoke or fog.

Prevention

Preventive measures in cor pulmonale include prevention of the primary disease, where this is possible—as in tuberculosis, parasitic lung disease and the pneumoconioses—and measures designed to delay the development of the cardiac lesion. But the major preventive field is in connexion with the chronic lung diseases: bronchitis, asthma, emphysema and bronchiectasis. In the industrialized countries of temperate zones the excess of mortality in middle-aged men due to smoking, and in large towns due to air pollution, is well known. These two factors are of the greatest importance in initiating and aggravating the disease. In addition, the much higher death rate in unskilled workers of both sexes points to some other ill-defined domestic factor such as infection in overcrowded, poorly heated, and badly ventilated rooms. Measures to limit cigarette smoking and to control air pollution are clearly advisable; but the first is not easy and our knowledge of the irritant components of the air of cities is still incomplete. Modern methods of heating and ventilation may reduce the risk of respiratory infection in the home; and in the workshop and factory it is important to suppress dust and other irritants and continue the search for hitherto unsuspected occupational hazards.

In preventing cardiac complications or forestalling cardiac failure rest is very important. Change to lighter work in the early stages of the disease is advisable, and prolonged rest is most valuable for any patient with chronic lung disease whose cardiac condition has begun to deteriorate. Anticoagulants are used whenever thrombosis plays an important part in etiology, and venesection is sometimes indicated when there is polycythaemia and a raised blood volume.

Research

The Expert Committee noted that much research is needed to fill the gaps in our knowledge of the origin and distribution of cor pulmonale. International comparisons of mortality in relation to social class and habits should provide much help in isolating important environmental data. As hospital admissions are usually too selective to be a good index of real incidence, special prevalence surveys in population groups may be needed, together with studies of air pollution and other environmental factors. In the clinical field it is necessary to know more about the haemodynamics and control of the pulmonary circulation and the significance

of related electrocardiographic abnormalities. New methods for the study of pulmonary and cardiac function in life are required; and, in therapy, it is important to assess therapeutic methods by carefully controlled clinical trials.

All this requires a great number of skilled personnel, and training will therefore be needed: training of clinical investigators in all the techniques required in the full appreciation of cardio-respiratory relationships; training of pathologists in accurate autopsy measurement of right ventricular hypertrophy and in earlier correlation of their findings with the clinical state; training designed to encourage in both clinicians and epidemiologists an interest in the epidemiological aspects of heart disease associated with chronic disturbance of lung function.

In all these fields, both in connexion with socio-environmental studies and with purely clinical research, the standardization of technical procedures and the collection of data are essential if statistical methods are to be validly applied to material from different sources. Here WHO can play an important part by arranging meetings of experts, disseminating information on standardized techniques, sponsoring field surveys on an international basis, and encouraging training in research requirements.

MOLLUSCICIDES IN BILHARZIASIS

At present the most effective single method of controlling bilharziasis is elimination of the snail intermediate hosts. The discovery of new molluscicides in recent years makes it desirable to assess the role now played by these compounds in the control of the disease. A WHO Expert Committee on Bilharziasis met for this purpose in Geneva from 26 September to 1 October 1960.[1]

Other methods of controlling the spread of bilharziasis are briefly reviewed in the Committee's report,[2] but it is clear that the mass treatment of human cases with present drugs, the provision of safe domestic water, or attempts to prevent human contact with water containing snails in the infective stages, are all likely to be ineffective unless the snails themselves are greatly reduced in number or completely eliminated. The Committee points out that in certain circumstances capital expenditure for permanent sanitary improvements or engineering works leading to the disappearance of snails may be found to offer a better investment than molluscicides used over a long period of time. However, in general, control of the snail hosts by the application of molluscicides is the immediate method of choice in most endemic areas.

Methods of snail control

Many possible methods for snail control have been proposed, such as biological control, reduction of the size and number of snail breeding-places, and special treatment of habitats to render them unsuitable. The Committee concluded that, in spite of a few disadvantages, the use of toxic chemicals appears to be the most rewarding. It suggested that, although not all endemic areas are suitable for the use of molluscicides, they could be much more widely applied than at present: successful snail control by this means alone has been shown to be possible in Japan, Brazil, Venezuela, Egypt, and Rhodesia and Nyasaland.

Advantages and disadvantages of molluscicides

The advantages of control by molluscicides are several. There is rapid interruption of the transmission of infection. It is possible to suppress the cycle of transmission (and

[1] Members of the Committee: Dr N. Ayad, Province of Egypt, United Arab Republic (Vice-Chairman); Dr F. S. Barbosa, Brazil: Dr. D. M. Blair, Federation of Rhodesia and Nyasaland (Rapporteur); Dr R. A. E. Galley, United Kingdom; Dr J. Gillet, Belgium (Rapporteur); Dr R. Gönnert, Federal Republic of Germany; Dr Y. Komiya, Japan; Dr W. H. Wright, USA (Chairman). Representative of the Food and Agriculture Organization of the United Nations: Dr E. A. Eichhorn. Secretariat: Dr N. Ansari, WHO (Secretary); Dr E. G. Berry, USA (Consultant); Dr W. M. Bonne, WHO; Mr Z. J. Buzo, Australia (Consultant); Dr R. W. Fay, WHO; Dr D. B. McMullen, WHO; Dr L. J. Olivier, USA (Consultant); Mr J. W. Wright, WHO.

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1961, 214.

eventually reduce the level of bilharziasis infection in the exposed population) over a long period by reapplication of the chemical at suitable intervals. The herbicidal properties of certain molluscicides provide an opportunity of cheap weed control and clearance of irrigation canals. Occasionally the destruction of snails also involved in the spread of trematode infections of domestic animals may be an added advantage. Being administered by trained personnel, this method of control does not involve complicated regulations for the people in the area, nor does it require their close co-operation.

There are also certain disadvantages. The employment of molluscicides is relatively costly, since applications must usually be repeated over a period of time—often for years—before adequate snail control is achieved. The problem of reinfestation has unfortunately not been solved, and it is not always possible to ascertain the means by which repopulation occurs—assuming, that is, that the molluscicide has been effective in destroying all the snails and their eggs. Economic considerations make it imperative that an efficient molluscicide should be relatively cheap and in adequate supply. Technical miscalculations and faulty application lower the efficacy of any chemical control operation; in some instances methods of application have been inadequate, and the efficiency of the molluscicides therefore lower than it could have been. Molluscicides now in use kill fish, and precautions should be taken to avoid building up phytotoxic levels in irrigation channels.

Elimination of intermediate host snails from limited areas in endemic regions has been achieved, but the goal of extending these gains, and hence of interrupting transmission of bilharziasis throughout an endemic region, is a difficult one; to achieve it, proper application of a highly effective molluscicide must be combined with means of preventing reinfestation of habitats cleared of snails.

Available molluscicides

There are many molluscicides in current use, and others recently developed are now becoming available. The report discusses copper sulfate, sodium pentachlorophenate, copper pentachlorophenate, Bayer 73 (5-chlorosalicylic acid (2-chloro-4 nitro-anilide)), Aqualin, I.C.I. 24223 (iso-butyl-triphenyl-methylamine), copper carbonate, dinitro-ortho-cyclohexyl phenol and calcium arsenate. Among these, copper sulfate is the longest-established molluscicide still in regular use throughout the endemic bilharziasis areas, while sodium pentachlorophenate is apparently the most popular of those in routine use. Of the more recently developed molluscicides, Bayer 73 appears to be effective over a wider range of aquatic habitats and ecological conditions than either copper sulfate or sodium pentachlorophenate, and would seem to be the most promising of the newer compounds. It will shortly be used in routine snail control programmes. Further data on each of these molluscicides are given in a comprehensive table annexed to the report.

Campaign operations: first steps

At the outset of a snail destruction programme, it is essential to establish the identity of the intermediate host involved, as differences in susceptibility to infection occur among different snail species as well as within the same species. Prior studies of the snail ecology and hydrography of the area are necessary for the intelligent employment of molluscicides, in particular in relation to seasonal fluctuation and the life-cycle of the parasite. The necessity of measuring reliably the density of the snail population before and after the use of a molluscicide should be self-evident; the three most suitable methods (the quadrat method, the method of sieves and nets, and the method of counts per unit of time) are fully described. A technique is likewise recommended for the determination of the prevalence of schistosome infection in snail populations before and after the application of molluscicides. Studies of human bilharziasis infection rates and of the prevalence of trematode infection in domestic animals should similarly be carried out using standardized techniques. Mapping of the area proposed for survey is essential. Steps should of course be taken to ensure that sufficient trained staff is available to carry out the

programme: the Committee were unanimous in requesting that the International Training Course held by WHO in 1958 in Cairo should be followed up by similar courses in bilharziasis control at appropriate centres. They also noted that the toxicological studies on pesticides being sponsored by WHO could be applied to molluscicides, some of which require special precautions in handling and application. Preparations for a molluscicide campaign should include the securing of public interest and co-operation. Finally, standard methods of record-keeping should be devised, so as to render the results of campaigns intelligible to workers elsewhere.

Problems of application

Several questions arise in connexion with the application of molluscicides. The report makes suggestions on how to choose the most suitable molluscicide, how to measure dose rates for different stretches of water (flowing and stationary), how to estimate molluscicide concentrations, and how to select application procedures in relation to snail species, habitat, type of compound, and availability of equipment.

Methods for estimating the effectiveness of molluscicides in the field are then discussed. In addition to those proposed for pre-treatment survey, other methods are considered—the use of attractant surfaces and of snail cages, fish and shrimp methods, the estimate of the effect on the fluke diseases of animals, and the measurement of residual activity.

The economic importance of campaigns with molluscicides is touched upon. One of the aspects of these campaigns on which little work has so far been done is the action of these chemicals on the macrofauna, microfauna, and microflora of the habitat of the snails. Repopulation of cleared areas by snails also requires further investigation; in the Sudan and Egypt, mechanical barriers are reported to have prevented many snails from entering irrigation systems.

Future developments

The Committee felt that, in view of the limitations of existing molluscicides, every effort should be made on an international basis to find promising new ones. A wider range of chemicals is also required to meet the diversity of ecological conditions and the possibility of acquired resistance to currently used molluscicides. Lack of uniformity has been noted in screening procedures: steps should be taken to encourage the use of a standardized molluscicide-testing procedure to ensure comparability of data obtained in various laboratories. Such a screening programme might consist of three progressive stages, which are in fact all part of one process, although the phases of examination might be carried out by different people in widely separated places:

Stage 1 — (*a*) Screening by industrial or other laboratories;

(*b*) Testing promising compounds in accordance with standard test procedures;

Stage 2 — Further assessment of promising substances arising from Stage 1;

Stage 3 — Field testing under operational conditions.

It would be desirable for Stages 2 and 3 to be under one scientific direction.

A provisional method is proposed for first-stage screening of molluscicides acting in solutions. Promising compounds from Stage 1 would receive further assessment—first, by an increased testing of the compound against the snail strain used in the screening test or against another standard test strain; second, by tests against other vector species; third, by toxicological and pharmacological tests; and fourth, by determination of chemical and physical characteristics. The Committee recommends that specifications should be drawn up immediately for each satisfactory formulation as it is developed.

Physiological and biological studies of the mode of action of molluscicides on snails are required. Field trials of the substances at the second stage should take place under a wide variety of conditions, while at the third stage such trials should be arranged in connexion with either a pilot project or a national

scheme of control, under the most standardized conditions possible.

The Committee felt that existing formulations, current methods of application, and equipment now in use could be improved, and that efforts should be made to develop a combined molluscicide/herbicide that would be of particular advantage where it is desirable to control both the vegetation and the snails in irrigation canals.

MALARIA ERADICATION IN 1960*

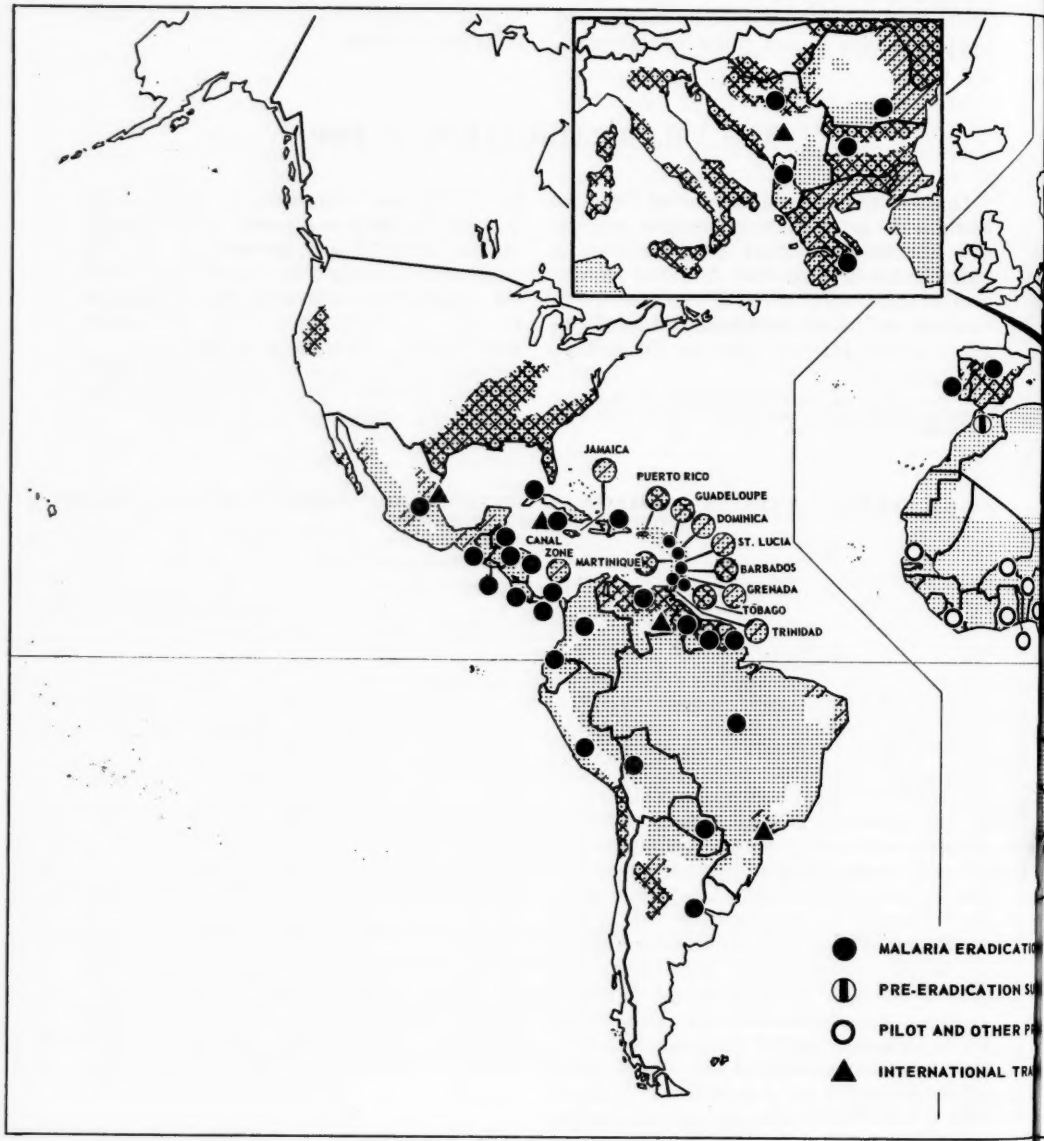
During the first nine months of 1960, the world-wide programme of malaria eradication continued to make progress both in scope and in quality. Out of a total population of 1336 million living in currently or formerly malarious areas from which information is available (see Table 1), 298 million, or 22.3%, are now living in areas where malaria has been eradicated, while over 612 million (45.9%) are covered by malaria eradication programmes. Preliminary malaria eradication activities (pre-eradication surveys and pilot projects) are now under way in areas containing a population of 170 million (12.7%). A population of 255 million (19.1%) is still living in areas where no eradication scheme has been planned.

* Condensed from unpublished working document A14/P&B/2 Part I, presented by the Director-General of WHO to the Fourteenth World Health Assembly.

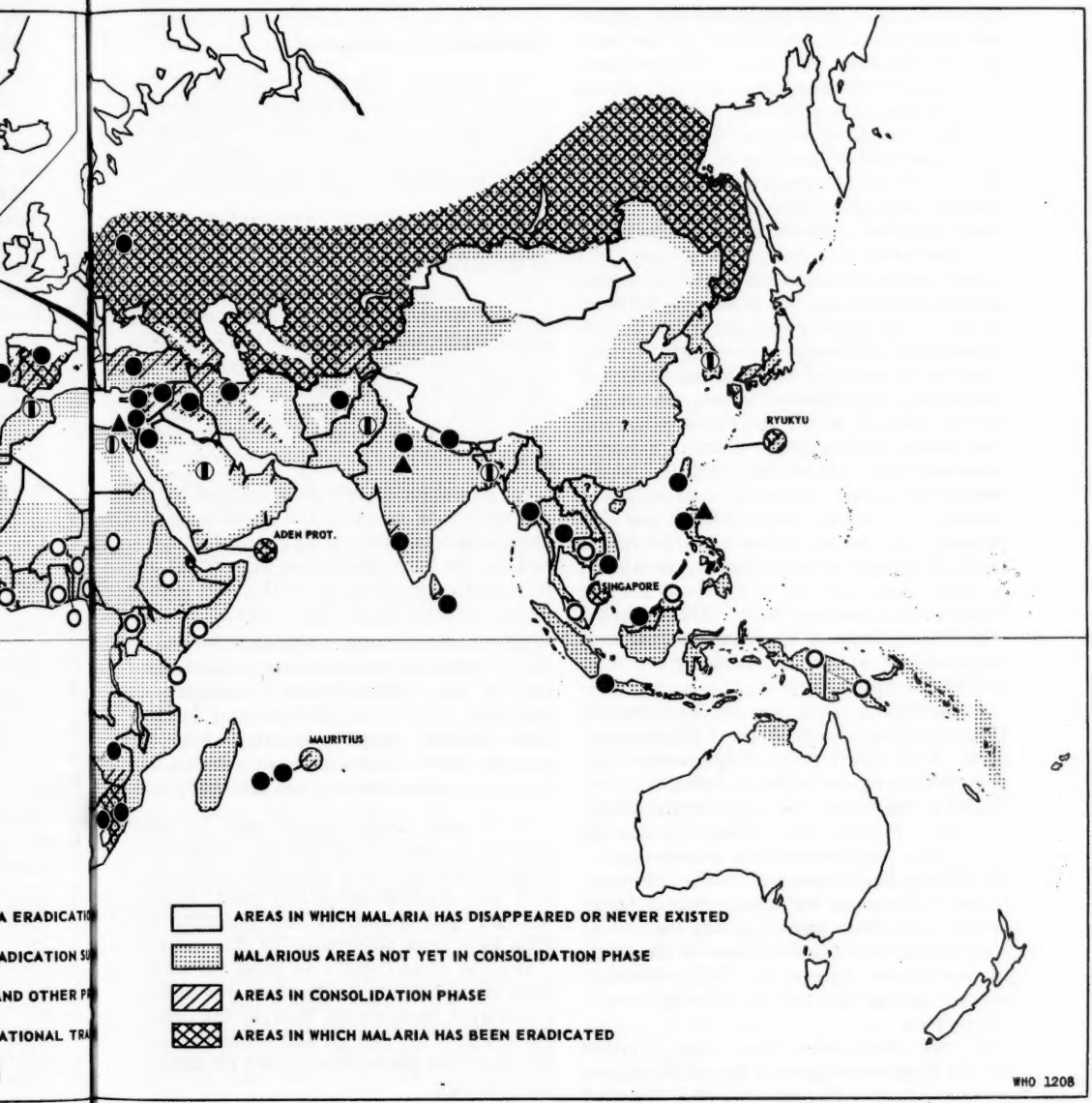
TABLE 1. SUMMARY OF STATUS OF MALARIA ERADICATION BY WHO REGION AS AT 21 OCTOBER 1960 (POPULATIONS IN THOUSANDS)

WHO Region	Total populations	Malaria never indigenous or disappeared without specific measures	Original malarious areas	Malaria eradicated	With eradication programme				Pre-eradication surveys	Pilot projects	No eradication programme under way
					Consolidation phase	Attack phase	Preparatory phase	Total			
Africa	154 671	13 405	141 266	2 679	1 742	841		2 583		4 625	131 379
America	400 516	257 812	142 704	54 365	10 011	53 490	2 105	65 606			22 733
South-East Asia	564 469	34 945	529 524	1 367	2 745	432 263	22 067	457 075	20 735		50 347
Europe	674 568	389 554	285 014	224 922	27 755	15 905		43 660	7 500		8 932
Eastern Mediterranean	205 945	41 698	164 247	1 093	9 475	11 741	1 407	22 623	112 397	1 130	27 004
Western Pacific *	206 486	133 297	73 189	13 586	3 503	11 573	6 000	21 076	22 974	567	14 986
Total *	2 206 655	870 711	1 335 944	298 012	55 231	525 813	31 579	612 623	163 606	6 322	255 381
Western Pacific **	665 722										
Total	2 872 377										

* Where information available.
** Information not available.


JAMAICA
PUERTO RICO
GUADELOUPE
DOMINICA
ST. LUCIA
BARBADOS
GRENADA
TOBAGO
TRINIDAD
CANAL ZONE
MARTINIQUE
MALARIA ERADICATION
PRE-ERADICATION
PILOT AND OTHER
INTERNATIONAL

ADICATIGATION IN DECEMBER 1960



There are definite indications that eradication will shortly be achieved in most of the countries where planning has been thorough, operations have been performed with vigour and determination, evaluation of the programme has been critical and frequent, and the governments have given their full support by providing financial and administrative facilities. On the other hand it is also evident that a number of malaria eradication programmes have not progressed according to schedule, and that their operations have not been carried out with the requisite thoroughness and speed.

Well-planned and well-executed pilot projects have shown that it is technically feasible, by means of total coverage with effective insecticides, to interrupt transmission in many areas of tropical Africa. The feasibility of interrupting transmission is only one of the factors essential to the success of a malaria eradication programme; others are administrative and operational facilities, availability of trained personnel, and sufficient financial provision. Nevertheless, tentative planning for malaria eradication in Africa need no longer be regarded as an almost hopeless task, and can proceed on a more objective and rational basis. This, coupled with the eagerness of newly emerged African countries to eradicate malaria, gives solid ground for optimism.

In the Region of the Americas considerable progress has been made in most programmes, many of which are proceeding towards their goal according to schedule, despite some technical problems. In the Eastern Mediterranean Region the majority of existing eradication programmes have shown signs of progress in both scope and quality, although there is still room for improvement. Great strides have been made towards the attainment of the consolidation phase in the whole of continental Europe by 1962. There is every hope that this will be achieved according to plan.

In the South-East Asia and Western Pacific Regions, progress is less uniform: two projects are so well organized and advanced that eradication is in sight, while some are still in the pre-planning stage. Yet others are suffering from serious set-backs or have come to a standstill owing to operational, administrative and financial difficulties.

Epidemiological assessment

An epidemiological assessment of the status of malaria eradication programmes has to be based on the attainment or non-attainment of certain objectives at various stages of the campaign. These objectives are:

(*a*) *interruption of transmission*, which should be achieved during the first two years of the attack phase;

(*b*) *substantial reduction of the residual parasite reservoir towards the end of the attack phase*, which should be a continuous process after the interruption of transmission and should, under favourable conditions, achieve a level low enough to permit the withdrawal of spraying by the fourth year of the attack phase;

(*c*) *consolidation*, which is marked by the prevention of renewed transmission in the absence of total coverage by residual spraying, and by the final elimination of residual and imported cases of malaria—this will require on the average two to three years;

(*d*) *eradication—the maintenance phase*: all the criteria for achieved eradication as set out by the WHO Expert Committee on Malaria [1] have to be fulfilled, and freedom from malaria must be maintained by the general public health services without any need for a special malaria surveillance system.

It is today comparatively easy to judge whether a country or an area of a country has attained the two final objectives (consolidation and eradication/maintenance), because detailed epidemiological and statistical criteria have been elaborated for this purpose.

It is far more difficult to judge the attainment of the two initial objectives in a malaria eradication programme, because the criteria are not so easily defined and epidemiological data in attack phase areas are not yet reported fully enough.

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1957, **123**, 4; 1959, **162**, 5; 1961, **205**, 32.

Thus, while the map on pages 202-203 indicates malarious areas not yet in the consolidation phase, this does not mean that substantial progress towards eradication may not have been made in parts of these areas.

In Central and South America practically every country is engaged in a malaria eradication programme which, in most cases, started in 1956 or 1957. During the period under review there was a substantial increase in the number and extent of areas reaching the consolidation phase. The population living in areas in the consolidation phase increased from 2 156 000 in 1959 to 10 010 000 in 1960. In several countries satisfactory progress has also been made in attack phase areas, in which interruption of transmission has been obtained as well as a further reduction of the parasite reservoir, with good prospects of completing the attack phase within the scheduled time. In a larger number of countries, however, progress has been less satisfactory, and complete interruption of transmission has not yet been achieved. This delay has been chiefly due to technical causes, including the acquired resistance of malaria vectors to residual insecticides, which has created serious problems in a small number of projects. In a large number of projects with long transmission seasons, epidemiological evaluation has shown that interruption of transmission could not be achieved by a single annual spraying cycle. In all these programmes spraying operations have had to be replanned. It is reasonable to expect that this will lead to the interruption of transmission, but the change has been too recent for an evaluation of the results.

In continental Europe, governments have pledged themselves to give priority to malaria eradication programmes, so as to accelerate the eradication of malaria under a coordinated plan. According to this plan every country in the area should reach at least the consolidation phase in all districts by 1962. Data for the year 1960 show that substantial progress has been made in this direction, and that very few attack phase areas are left. In the originally malarious areas of the USSR the rapid progress towards eradication already made in previous years continued in 1960, and operations covering 80% of the population living in these areas are already in the maintenance phase.

Good progress towards eradication has been made in a number of countries between the eastern shores of the Mediterranean and the Persian Gulf; interruption of transmission has been achieved in almost all attack phase areas and some areas have already reached the consolidation phase. In Ceylon the eradication programme had already by 1955 gained considerable success, but it suffered a severe set-back in 1956-57, when large areas from which spraying had been withdrawn had again to be put under total coverage. Data for 1960 show that the malaria incidence in these resprayed areas is now rapidly declining to a very low level, which will make withdrawal of spraying feasible in the near future; the incidence in consolidation phase areas is practically zero. In China (Taiwan), rapid progress towards complete eradication continued in 1960. The total number of cases of malaria detected in this island in 1960 out of a population of approximately 10 million in originally malarious areas was only 44. Complete eradication is well within reach in this country.

On the other hand, in many projects in the rest of Asia and the Western Pacific—for instance, in Burma and the Philippines—interruption of transmission has not yet been achieved in all parts of the attack phase areas, even though spraying operations have gone on for four years or even longer. Such delays are chiefly due to administrative and operational deficiencies, such as budgetary problems, staffing difficulties, etc.

In India the antimalaria programme was converted into an eradication programme in 1958-59. This large programme represents a tremendous organizational achievement, but it is too early for an epidemiological assessment of its results.

In Africa (south and east of the Sahara) malaria eradication programmes are in their final stages in Natal and Northern Transvaal (Union of South Africa), and in Swaziland and Mauritius. Mauritius, which had been considered to be in the consolidation phase from 1957 onwards, suffered a set-back in the

first half of 1960 through an outbreak of malaria with 1100 cases in an area with a population of 70 000, forming part of the originally malarious area (total population 630 000). The area where the outbreak occurred had to be put back under total coverage. This set-back can be ascribed almost entirely to the delay in instituting full surveillance measures at the end of the attack phase. In the remainder of Africa (south and east of the Sahara) no country-wide eradication programmes are yet in operation.

The role of WHO in eradication

Five years' experience of malaria eradication programmes has served to demonstrate more clearly than ever the fundamental necessity for sound planning. In the past, plans containing less than the minimum requisites have occasionally been implemented in the hope that the deficiencies would be remedied later, but never with complete success. In April 1960, the Director-General of WHO formulated a specific schedule of 22 minimum provisions that must be satisfied before a plan of operations can be given technical approval. In every case a very comprehensive " programme proposal " must be submitted, based on a careful study of the organizational framework, the methods to be used, and the extent of the respective commitments of the country and the international agency, and in a form giving convincing evidence of feasibility and appropriateness of methods, together with a realistic estimate of the over-all costs of the programme.

The report of a WHO Expert Committee on Malaria [2] that met in Geneva from 25 to 30 July 1960 proposed a new type of assistance which may be required in developing countries as a prelude to a full eradication programme. The report states:

" A developing country from the malaria eradication point of view is one in which the general administration and health services have not yet reached a level which would enable it to undertake a malaria eradication programme, and in which, therefore, the necessary basic foundations for this kind of closely co-ordinated, thorough and time-limited activity have first to be laid.

" Thus, in countries where the fundamental elements required for the proper setting up and implementation of malaria eradication procedures are lacking, it is advisable to consider the undertaking of preliminary operations adapted to the socio-economic conditions and general developmental status of each country. These operations would be in the nature of a ' pre-eradication programme '."

The absence of clear definitions and appropriate terms of reference for the different types of malaria eradication country projects had created a great deal of confusion in planning and financing. It was thus necessary to define and classify the specific types of projects to which the Organization can give its support. These fall under six headings: (*a*) malaria eradication programmes; (*b*) pre-eradication survey projects; (*c*) malaria eradication pilot projects; (*d*) pre-eradication programmes; (*e*) malaria eradication training projects; and (*f*) field research projects. Each type may be briefly described as follows:

(*a*) A *malaria eradication programme* is an operation aimed at ending the transmission of malaria and eliminating the reservoir of infective cases, in a campaign limited in time and carried to such a degree of perfection that, when it comes to an end, there is no resumption of transmission. The programme may be carried out either simultaneously throughout a whole malarious area or by stages. It comprises four phases: preparatory, attack, consolidation and maintenance (as defined in the sixth report of the WHO Expert Committee on Malaria [3]).

(*b*) A *pre-eradication survey* is an operation with the aim of collecting the accurate data on the malaria situation that are needed for the preparation of a complete plan of operations for an eradication programme. The survey ends when the plan has been prepared.

(*c*) A *malaria eradication pilot project* is an operation to find out whether certain single

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1961, **205**, 38.

[3] *Wld Hlth Org. techn. Rep. Ser.*, 1957, **123**, 30-33.

or combined antimalaria measures will, if properly applied, bring about the interruption of transmission.

(*d*) A *pre-eradication programme* is a preliminary operation undertaken in a country whose general administrative and health services have not yet reached a level that would enable it to undertake a malaria eradication programme and in which, therefore, the necessary basic foundations for this kind of co-ordinated, thorough, and time-limited activity have first to be laid. The operation must be planned and adapted to the socio-economic conditions and general state of development of the country concerned.

(*e*) *Malaria eradication training projects* consist mainly in financial and technical support for the establishment and development of malaria eradication training centres with properly organized field training areas and regular courses for senior and junior officials, and in the adequate provision of fellowships for national malaria staff.

(*f*) *Malaria eradication field research projects* are special projects designed to find new ways and means of interrupting transmission where conventional methods have failed.

In previous documents on the world-wide programme for malaria eradication, tropical Africa has been omitted, or presented in a very tentative way. However, enough experience has now been gained to formulate an eradication policy for that part of the world. A careful study of results so far obtained in pilot projects in tropical Africa shows that the interruption of transmission is technically feasible in many areas, and that there is therefore no reason to continue with pilot projects as such. These should be converted directly either into malaria eradication programmes or, where administrative and technical preparedness is not yet adequate to meet the exigencies of a malaria eradication programme, into pre-eradication programmes. But if pilot projects to ascertain the feasibility of interrupting transmission are no longer necessary, a new type of pilot project, with the exclusive purpose of finding ways and means of increasing the speed and reducing the cost of eradication, is now being planned. Another type of pilot project, the administration of medicated salt, is already in operation in part of western Africa; its scope might be enlarged. It is possible to visualize two large eradication programmes on the African mainland, one in the west and one in the south-east, each involving several countries and taking in adjoining territories as soon as possible after assessment of the adequacy of existing facilities for their inclusion.

In 1957, the sixth report of the WHO Expert Committee on Malaria [4] laid down criteria for establishing that eradication has been achieved. Since then, a number of difficulties have arisen in the application of one of these criteria, i.e., " proof that an adequate surveillance system has operated in the area for at least three years, in at least two of which no specific anopheline control measures have been carried out ".

There are a number of countries in which it can be assumed that eradication has been achieved, in the whole or in part of their territory, not by an orthodox short-term eradication programme with all the prescribed phases, but by a long process involving methods other than the application of residual insecticides (larvicidal operations, treatment of cases, etc.). In its eighth report,[5] the WHO Expert Committee on Malaria accordingly amplified the criteria for eradication in such a way as to allow for these special circumstances, without in any way departing from the original definition of malaria eradication and the basic epidemiological criteria.

The Thirteenth World Health Assembly requested " the Director-General to establish an official register listing areas where malaria eradication has been achieved after inspection and certification by a WHO evaluation team ".[6] This task was started during the period under review.

The redefinition of criteria by the Expert Committee was one important preliminary

[4] *Wld Hlth Org. techn. Rep. Ser.*, 1957, **123**, 4.
[5] *Wld Hlth Org. techn. Rep. Ser.*, 1961, **205**, 32.
[6] *Off. Rec. Wld Hlth Org.*, 1960, **102**, 25 (WHA13.55).

step. The methodology of certification was discussed at the annual meeting of Regional Malaria Advisers, and was also studied by the Expert Committee on Malaria. Among the conclusions reached, there were two of particular importance. One is that certification of malaria eradication in a particular area may be sought by a government from WHO before eradication has been achieved in the whole national territory, provided that the area for which the claim is made is not smaller than 50 000 square kilometres (with certain exceptions and qualifications). The other is that the eventual final certification of malaria eradication in an area requires one to two years' auditing of the quality of surveillance operations and their results in a given country.

During 1960 there was a continued tendency in the field to revert to the use of DDT once current stocks of dieldrin were exhausted. This was because it has now been confirmed from many parts of the world that resistance to dieldrin in anophelines is more frequent, more rapid in developing, and more intense than DDT resistance.

Resistance to dieldrin has now been reported in 14 vectors, and resistance to DDT in 6 vectors. In nearly every case resistance is found in only part of the geographical range of the species concerned, and in a number of cases it is strictly localized. The figures just given refer to cases of highly developed resistance, in the sense that a majority of mosquitos in the affected populations can withstand exposure to rather high concentrations of the insecticide. In the presence of DDT it happens more often that a mosquito population acquires only a limited tolerance, which may or may not render the insecticide ineffective if applied at an increased dosage, or with increased frequency. Finally, there is now some evidence to suggest that mosquito strains resistant or tolerant to DDT may again become susceptible to this insecticide fairly soon after spraying is discontinued.

Malathion is occasionally used in restricted areas where DDT resistance is a problem, although it cannot yet be regarded as an insecticide of proven value in malaria eradication. The search for suitable alternative insecticides and formulations continues.

Although organophosphorus insecticides have generally a short residual effect and are relatively toxic to humans, research has shown that a certain number of them could nevertheless be used in malaria eradication campaigns. Field trials have been conducted in Greece and in El Salvador. A special WHO team (the Insecticide Testing Unit) is now studying certain aspects of the problem in Nigeria.

The latest development for the control of adult mosquitos is the residual fumigant technique, using highly volatile insecticides. Studies of a product called DDVP (O,O-dimethyl 2,2-dichlorovinyl phosphate) are in progress.

Work on the development of improved entomological methods for malaria eradication programmes continues. One of the most important improvements would be a method yielding a generally acceptable index of the proportion of mosquitos killed as a result of visiting a room sprayed with insecticide. This should make it possible to economize on insecticides and labour. In this connexion, WHO is enlisting the help of a number of national institutions and field laboratories.

The use of antimalarial drugs in eradication programmes is no longer confined to those special circumstances where spraying with residual insecticides is impracticable or ineffective. Chemotherapy now plays an important part in every phase of eradication. Although residual insecticide spraying on a total coverage basis is the fundamental measure in practically all programmes, the time required for achieving complete interruption of transmission and elimination of the parasite reservoir may be reduced by the judicious use of antimalarial drugs. Radical treatment of all those found positive for malaria parasites should preferably be already in operation during the last one or two years of the attack phase, in order to eliminate the largest possible number of infections before spraying is withdrawn.

After the successful completion of the attack phase, the use of antimalarial drugs is

of first importance throughout the consolidation phase. During this phase, single-dose treatment of all suspected malaria cases and subsequent radical treatment of all confirmed cases are the principal measures for the elimination of all residual infections and foci of transmission. In the maintenance phase, drugs are equally essential for preventing any new spread of the disease from imported cases.

In areas where complete interruption of transmission by insecticides alone proves difficult or is delayed owing to a certain amount of outdoor resting and biting by the vector, mass drug administration, as a supplementary measure to residual spraying, may be required throughout the attack phase.

Finally, there are circumstances that totally preclude the use of insecticides or in which they are ineffective. In these conditions, chemotherapy may be the only method of attack. The main difficulty of mass drug administration—i.e., to ensure that the drug is ingested regularly by the whole population—may be to some extent overcome by adopting Pinotti's method[7] of mixing antimalarial drugs with the common household salt supplied to the people by a government agency. This method has been used with good results during recent years in several areas of Brazil, and is now being extended to the whole Amazon Basin. Chloroquine is now considered to be the most suitable drug for use in medicated salt. One of the main obstacles to the large-scale application of chloroquinized salt has been the difficulty of preparing a chloroquine-salt mixture that would be sufficiently stable under tropical conditions of high humidity. There is evidence that a satisfactory solution of this problem has now been found; this will permit the application of the Pinotti method in a much more efficient way and on a larger scale.

WHO has the difficult and complex function of providing over-all strategic guidance for the world-wide programme, and technical advice, where necessary, on the choice of new tactical approaches. This involves the collection, scrutiny, consolidation and analysis of a considerable amount of data.

[7] See *WHO Chronicle*, 1959, 13, 362.

Technical leadership for malaria eradication covers a large number of activities, ranging from the central planning of the over-all strategy to day-to-day advice at the peripheral level. To cope with these responsibilities the Organization maintains technical services at three levels: (1) the Division of Malaria Eradication at WHO Headquarters, Geneva; (2) the Malaria Eradication Units at the Regional Offices; and (3) the country advisory teams.

In the Division of Malaria Eradication at Headquarters, three units have been established to deal with the enlarged responsibilities of planning, training, research and epidemiological assessment. One unit has the exclusive duty of following up the eradication process in its most critical stage, i.e., when malaria is reaching the vanishing point; its tasks are the promotion and improvement of epidemiological assessment and the critical study of the results. A second unit is responsible for promoting and co-ordinating all research, for the preparation and distribution of technical documents, and for consolidating and summarizing reports. The third unit carries out the programme and planning activities formerly entrusted to two separate units.

In the Malaria Units at Regional Office level, steps have been, and are being, taken to establish additional posts wherever required, particularly those of adviser in malaria eradication administrative methods, epidemiologist, parasitologist (specifically to advise and train on laboratory techniques), and health educator.

The present numbers, designations and distribution of international technical staff engaged in the malaria programme of the Organization are shown in Table 2. For comparison, the corresponding figures are given for the end of 1958 and March 1960.

During 1960, special attention was paid to the improvement of training facilities for national and international personnel. Courses were given for special categories, e.g., engineers and administrative advisers, and it is hoped to hold more in the near future. Reorientation courses and refresher courses were also given. Junior national staff were

TABLE 2. WHO MALARIA STAFF IN 1958, 1960 AND 1961

	1958 (December)	1960 (March)	1961 (January)
Project Staff *			
Medical Officers	74	95	97
Engineers	19	30	32
Entomologists	31	43	55
Sanitarians	68	102	97
Technicians	31	65	46
Administrative Methods Advisers	0	3	3
Others **	21	31	50
Regional Advisers	17	30	33
ME Division, Headquarters	9	9	11
	270	408	424

* Includes project advisers, evaluation and special teams.

** Assistant malariologists, parasitologists, statisticians, health educators, etc.

Note: The posts are established under the following funds: Regular, Technical Assistance, Malaria Eradication Special Account, and Special Malaria Fund of the Pan American Health Organization.

trained mostly at country level, but the first nucleus received its training in international centres. Higher grades of national staff were trained in their own countries if facilities existed there; otherwise they were sent abroad to international training centres. The Organization has also helped in the establishment of certain national malaria training centres. In some countries, seminars have been held for medical officers engaged in malaria eradication. International personnel have also been trained in international centres, in which, generally speaking, courses are held regularly. These courses are given in Spanish at Maracay (Venezuela) and Mexico City (Mexico), in Portuguese at São Paulo (Brazil), in English at Kingston (Jamaica) and Tala (Philippines), and in English and Arabic at Cairo (Province of Egypt, United Arab Republic). In Yugoslavia, plans have been completed for the establishment of a malaria eradication training centre where the courses will be given in French. Malaria courses have also been given at the Institute of Malariology in Iran, the Malaria Institute of India, and the Malaria Research Institute in China (Taiwan). The establishment of another training centre in Africa, where courses could be given in both English and French, is being considered.

Research

The attention paid by WHO to problems of research on malaria has been steadily increasing during the past few years.

Research activities in the field of malaria may be broadly divided into three groups: (1) operational, (2) applied, and (3) fundamental. The term " operational research " is applied to research based on data collected during normal field activities. The term " applied research " refers to research on technical problems of general and immediate importance that have to be rapidly solved in order to overcome obstacles to malaria eradication. " Basic " or " fundamental research " refers to the pursuit of knowledge in the field of malaria, without necessarily assessing the potential usefulness of the results obtained.

The data acquired—almost incidentally—as a result of the ordinary field activities of the Organization are considerable and the task of assessing and consolidating them is increasing every year. Routine operational reports contain a vast amount of information of potential importance to research.

In applied research, the necessary work can occasionally be done in a scientific institution, but it is preferable—and more usual—to carry it out in the field. The principal subjects of applied research include: the epidemiology of disappearing malaria; surveillance procedures; ways of dealing with continuing transmission due to nomadism; the behaviour of vectors in sprayed areas; methods of drug administration in malaria eradication projects; local attitudes and customs in relation to malaria eradication activities.

WHO is carrying out a number of research projects of this type. For instance, the relationship between fever and parasitaemia and the practical aspects of surveillance are

being investigated in two large-scale experimental projects in India and Ceylon. The host-parasite relationship in malaria is being studied in Romania, India and West Africa. Studies on the improvement of present techniques of routine searching for malaria parasites in blood films are being conducted; these will involve the use of fluorescent stains or (if some technical difficulties can be solved) electronic scanning devices.

The greatest possible effort is needed to overcome the growing threat of resistance to insecticides. While there are already programmes of long-term investigation into the biochemistry of insecticidal action, the genetics of acquired resistance, the discovery of negatively correlated compounds, etc., there is urgent need for more applied research to find a means of overcoming the threat of the resistance of malaria vectors to chlorinated hydrocarbons. This can be done only by a more or less empirical testing, in the laboratory and in the field, of toxicants likely to be of value. The Organization has provided facilities for testing the new and less toxic insecticides in the field.

A large-scale field trial of a combination of amodiaquine and primaquine was begun in 1960 in Tanganyika, and the Organization has assisted three pilot projects (in Cambodia, Netherlands New Guinea and Ghana) which were instituted to assess the value of medicated salt.

A research project for the evaluation of spraying equipment was set up in 1959; by the end of 1960 it had tested equipment under field conditions in two different countries (Nigeria and Iran).

WHO is encouraging and materially assisting research projects carried out by national institutes and organizations to extend knowledge of fundamental aspects of malariology and to find techniques for applying existing knowledge.

It is obvious that some aspects of fundamental research, such as the study of immunity in populations in highly endemic areas, of strain specificity of malaria parasites, of genetics of resistance in laboratory colonies of *Anopheles*, of the biochemistry of malaria parasites, of the frequency of abnormal haemoglobins in some human races, etc., are of great interest. These researches are stimulated, assisted and followed up by WHO.

An interesting problem, which may be considered as lying half-way between fundamental and applied research, is that of simian malaria.

In its eighth report,[8] the WHO Expert Committee on Malaria made the following comments:

"In the present state of knowledge, it seems that malaria, as a zoonosis, is of only limited importance in the global programme of malaria eradication. The areas where foci of human malaria could perhaps be maintained from a simian reservoir of infection are few and relatively small in relation to the enormous territories where monkeys either do not exist or are present only in very small numbers, or where simian malaria parasites are absent, or non-infective to man, or not transmissible by those *Anopheles* that transmit human malaria.

"The true significance of simian malaria in relation to man will become apparent when the eradication of human malaria is accomplished in such areas of the world as Malaya, Borneo, Indonesia, Philippines, Taiwan, Central and West Africa. It is interesting to note that in large areas of Venezuela, in which malaria eradication has been achieved and which are known to contain large populations of monkeys, no sporadic cases of malaria have arisen, as would have been expected had there been a simian reservoir of malaria."

Much research in the field is still needed on the problem of simian malaria and its future implications. In the meantime, it should be noted that the discovery of the transmissibility of simian malaria parasites to man is likely to be of great importance in chemotherapeutic research, since for the first time a malaria parasite of a higher mammal, easily transmissible by *Anopheles*, can be used for laboratory trials of drugs that may be of importance in malaria eradication.

[8] *Wld Hlth Org. techn. Rep. Ser.*, 1961, 205, 47.

INTERNATIONAL WORK IN CHOLERA *

5. Practical control measures

Quarantine

As long as the endemic foci of cholera have not been eliminated, there will continue to be a need for international collaboration to prevent importation of the infection into other countries. Reference has already been made to the First International Sanitary Conference (1851), which drew up a convention including quarantine regulations for cholera. This convention was ratified by France, Portugal and Sardinia only. A second conference in 1859 was equally unsuccessful in obtaining agreement, and it was not in fact until 1892, at the Seventh International Sanitary Conference in Venice, that a convention was signed and ratified by all 14 States attending. This dealt primarily with protection against the introduction of cholera via the Suez Canal and contained certain provisions in regard to the Mecca pilgrimage. The 1892 convention was revised in 1893, 1894 and 1897, and notable progress was made in 1903 when a new convention was signed laying upon the signatory States the obligation to notify all other signatories of the appearance within their territories of the communicable diseases specified in the convention and to refrain from imposing against stricken countries defence measures in excess of those permitted by the convention.

In 1907, an event took place that was of major importance for the development of international quarantine practices. This was the signing of an international agreement for the creation in Paris of the Office International d'Hygiène Publique (OIHP), the first truly world-wide organization concerned with international health matters and the forerunner of the World Health Organization. Under its auspices, medical and diplomatic representatives from 41 countries met in Paris in 1912 to consider the revisions of the 1907 convention necessitated by the discovery that a healthy person could be a carrier of cholera and by confirmation of the role of the rodent in plague. The principle of less stringent quarantine practice found general acceptance, but the First World War prevented application of the convention until 1920, by which time revision was again due. At a further conference in Paris, the well-known International Sanitary Convention of 1926 was signed. This remained in force until amended by the United Nations Relief and Rehabilitation Administration in 1944; in the words of Gear & Deutschman [1] it " represented the ultimate achievement of the movement begun in the nineteenth century for a compromise between contending medical theories and between these and the practical needs of international movement of people and goods ".

Nevertheless, when WHO took over responsibility for international health matters, the position with regard to quarantine was still confused and unsatisfactory. Some of the countries having the greatest interest in maritime and air travel were bound by obsolete conventions or by none at all, and some of those signing the original conventions had not adopted the subsequent revisions. In fact, in 1946, when the WHO Constitution was drafted, 13 conventions and similar agreements were simultaneously in force; each had been drawn up with a specific objective, so that none entirely replaced its predecessor or any previous convention on

* This is the last in a series of articles intended to give a concise account of the public health aspects of cholera and to outline present trends in its control. The previous articles appeared in the January, February, March and April numbers of *WHO Chronicle* (1961, 15, 3, 52, 99, 144).

[1] Gear, H. S. & Deutschman, Z. (1956) *Disease control and international travel*, Geneva, World Health Organization. p. 12 (reprinted from *Chron. Wld Hlth Org.*, 1956, 10, 273-343).

the subject. Following preliminary studies by expert groups convened jointly by WHO and the OIHP, the First World Health Assembly, in 1948, set up the WHO Expert Committee on International Epidemiology and Quarantine to revise the existing international sanitary conventions and combine them into a single body of regulations to cover the needs of all travellers.

Meanwhile, the 1947 cholera epidemic in Egypt had provided the Interim Commission of WHO with a unique opportunity for discovering the weaknesses in the machinery then existing for the international control of epidemic disease. Thus, it was found that, apart from the broadcasts made by the epidemiological station at Singapore, the arrangements for the dissemination of epidemiological information were in need of modernization. It soon became apparent also that the quarantine measures being taken by many countries against Egypt were much in excess of the provisions of the conventions —which were considered adequate—and were seriously interfering with trade and food supply. One country, for example, forbade admittance to all passengers or goods from Egypt; another first required sea and air traffic from Egypt to call at specified places, then suspended it completely; yet another prohibited the import of foodstuffs, not only from Egypt but also from eight other countries " threatened " with cholera. Other countries put a ban on the import of Egyptian cotton as well as foodstuffs, forgetting that for years they had been importing jute from Bengal. The Interim Commission was able to curb some of these excessive measures, and when the Expert Committee met it laid down, as one of the essential principles on which the new international sanitary regulations were to be based, that the measures specified should be the maximum applicable in exceptional as well as in normal circumstances and should not therefore be exceeded by health administrations. It was pointed out that excessive measures, besides having harmful economic consequences, might defeat their own object by encouraging deliberate evasion of the sanitary control; the measures taken at frontiers should therefore be the minimum compatible with the existing sanitary situation. The Committee also emphasized that " accurate and rapid notifications were the basis of effective measures against the international spread of disease " and that " each country should develop its internal resistance to disease, rather than rely on measures taken at its frontiers ". The text of the new regulations drafted by the committee was submitted to WHO Member States for comments and suggestions. These were reviewed by a special committee established by the Third World Health Assembly and the revised draft of the International Sanitary Regulations was finally adopted unanimously by the Fourth World Health Assembly in 1951.

Under the provisions of these regulations in regard to quarantine for cholera, a ship is regarded as infected if it arrives with a cholera case on board or if a case has occurred within the five days before arrival. If there has been a case on board more than five days before arrival, the ship is regarded as " suspected ". An aircraft is regarded as infected if it arrives with a case of cholera on board, and as suspected if a person suffering from cholera has disembarked during the voyage. A ship or an aircraft that has come from an infected area or has on board a person who has come from such an area is regarded as healthy if the health authority is satisfied that no case of cholera has occurred during the voyage.

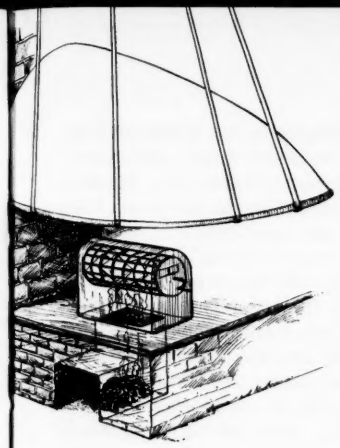
For the purposes of the regulations the incubation period of cholera is taken as five days. All health authorities must accept any standard for anticholera vaccines in force in the territory where the vaccination is performed. Passengers or crew members in possession of valid certificates of vaccination may be placed under surveillance for not more than five days reckoned from the date of disembarkation in the case of an infected ship or aircraft, or from the date of departure from an infected local area if the ship or aircraft has been certified as healthy; those not in possession of a valid certificate of cholera vaccination may be isolated for a similar period. On arrival of an infected ship or aircraft, the health authority may disinfect

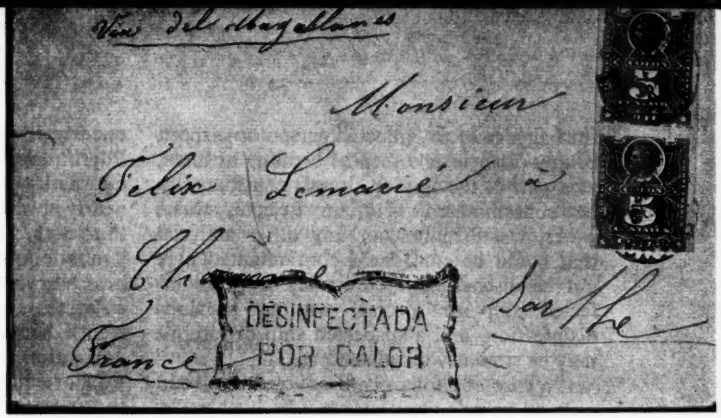
From the Kaiserin-Friedrich-Haus collection, Berlin, by courtesy of Ciba Aktiengesellschaft, Basle.

During the cholera epidemic in Berlin in 1831, a great many bizarre measures were recommended for warding off the disease. The dilemma of the Berliner anxious to take all possible precautions is depicted in this cartoon of the period.

Right: Disinfection and control of mail.

1. *Oven used for the disinfection of mail by sulfur fumes at Trieste in the eighteenth century.* **2.** *Letter sent from Chile to France in 1887, bearing the stamp* " DESINFECTADA POR CALOR " (" Disinfected by heat "). **3.** *Envelope perforated to admit disinfecting fumes and stamped with the health seal used by Bavarian border authorities in the early nineteenth century.* **4.** *" Rastel " used to perforate letters for disinfection.* **5.** *Wax seal used at the quarantine station of Wampersdorf, Austria, in 1831 for resealing disinfected letters.* **6.** *Certificate affixed to mail at Bozen (now Bolzano), South Tyrol, in 1831 claiming that no trace of Asiatic cholera or other infection had been noted in the area.*





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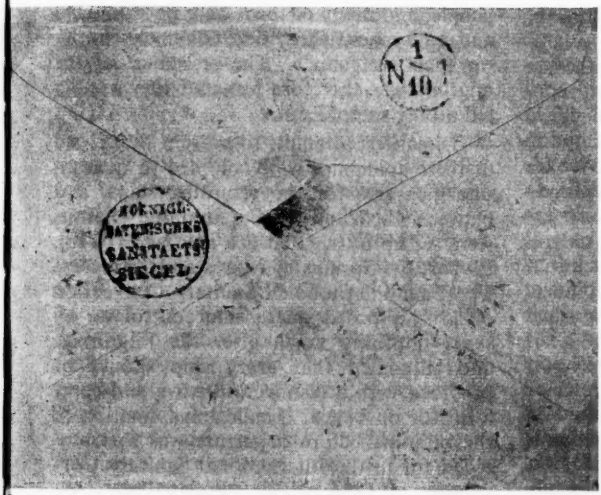

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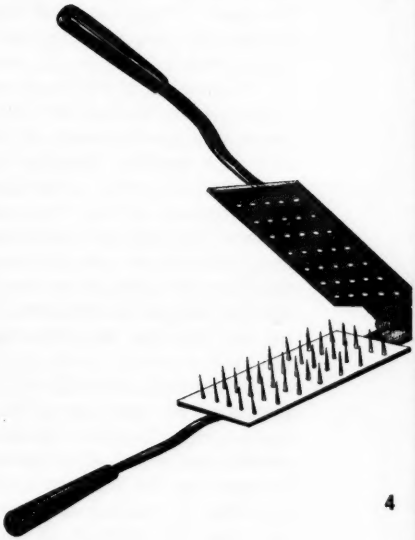

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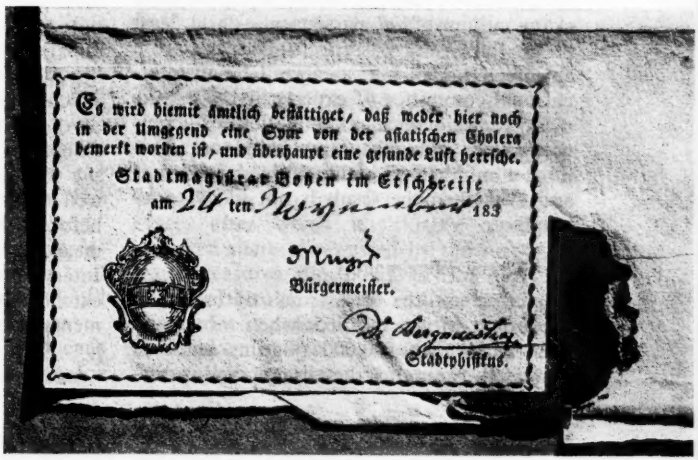

Es wird hiemit ämtlich bestättiget, daß weder hier noch in der Umgegend eine Spur von der asiatischen Cholera bemerkt worden ist, und überhaupt eine gesunde Luft herrsche.

Stadtmagistrat Hohen im Erzgebirge
am 24ten ... 183

Bürgermeister.

Stadtphisikus.

6

...trations kindly made available by Dr K. F. Meyer, The George Williams Hooper Foundation, University of California Medical Center, San Francisco

the baggage of any infected person or suspect, or any other article such as bedding or linen, or a part of the ship or aircraft considered to be contaminated. Human dejecta, waste water, waste matter, or any other material that could be considered contaminated may not be discharged or unloaded from an infected ship or aircraft without previous disinfection, and a suspected ship or aircraft may be similarly disinfected.

If a case of cholera is discovered in a train or road vehicle, suspects may be kept under surveillance for not more than five days from the date of arrival, and contaminated or potentially contaminated articles may be disinfected.

The health authority may prohibit the unloading from an infected or suspected conveyance of any beverages or of fish, shellfish, fruit or vegetables intended for consumption uncooked, or it may order their removal for safe disposal, unless there is no reason to believe that they are contaminated. In the case of a ship or aircraft, this applies only at the port or airport where the food or beverages are due to be unloaded, but the pilot of an aircraft has the right to require their removal.

The regulations further stipulate that only persons who have come from an infected local area within the incubation period of cholera and who have symptoms indicative of cholera may be required to submit to stool examination; no one can be required to submit to rectal swabbing. It had formerly been the practice of some countries to require stool examinations of *all* passengers—or at least of all third-class passengers—arriving from an infected area, but, as agreed by an international committee of experts in 1947, " the mass bacteriological examination of stools necessitates a highly complicated organisation, a number of highly trained personnel and even then the result is not likely to be reliable".

The Mecca Pilgrimage

Ever since the disastrous outbreak of cholera at Mecca in 1865, when more than one third of the 90 000 pilgrims gathered there fell victim to the disease and subsequently disseminated it over a wide area,[2] the Pilgrimage has been of much concern to international sanitary conferences. Cholera nearly always reached the Hedjaz by sea from the south, since the land caravans acted as " mobile quarantine stations ", their slowness allowing time for the disease to die out *en route*. During the latter half of the nineteenth century, the development of steam navigation and the opening of the Suez Canal, by shortening the journey to Mecca, favoured the spread of epidemics in both directions. The pilgrims always included a comparatively large number of women, children and old people, and many of them were poor, ill clad and badly nourished, depending on charity for their sustenance. The resistance of the pilgrims was therefore low and they readily fell a prey to epidemics.

The earliest attempts to prevent the spread of these epidemics were confined to quarantine measures for the returning ships, and between 1865 and 1881 quarantine stations were set up in the Red Sea area at El Wedj, El Tor, the Springs of Moses and Kamaran. The First International Sanitary Convention of 1892 imposed quarantine control on all ships returning north after the Pilgrimage and stipulated that every ship should be provided with a disinfection stove and carry a doctor on board. Medical examination of the pilgrims before departure was first provided for in the International Sanitary Convention of 1894, which stipulated that any persons suffering from cholera or choleraic disease were to be prohibited from taking part in the Pilgrimage. Furthermore, before departure all pilgrims were required to deposit a sum of money sufficient to cover the expenses of their voyage and the maintenance of their families during their absence. The Convention included a detailed description of the sanitary equipment of pilgrim ships as well as measures for their sanitary control before and during the voyage. These control measures were extensively revised in the 1926 International Sanitary Convention and were extended to caravans and trains; a supplementary agreement signed in 1929 by the

[2] See *Chron. Wld Hlth Org.*, 1957, **11**, 337.

Arab countries of the Eastern Mediterranean area made it compulsory for all pilgrims to be vaccinated against cholera before leaving their countries for the Hedjaz.

Since the adoption of adequate quarantine practices and other sanitary precautions, no further epidemics of cholera have occurred among the Mecca pilgrims. When the International Sanitary Regulations were drawn up, it was therefore decided, on the advice of a special sub-committee, to retain with slight modifications the special provisions regarding the Pilgrimage embodied in the 1926 Convention. In view of the increasing number of pilgrims travelling by air, special provisions were added relating to standards of hygiene and welfare in aircraft. The Kamaran Quarantine Station was replaced by the Quarantine Station at Jeddah for the sanitary control of pilgrims coming by sea from the south, while Suez took the place of El Tor for the control of pilgrim ships returning northwards.

In 1947, WHO began issuing yearly reports on the Mecca Pilgrimage and these showed a steady improvement in the health measures adopted for the protection of the pilgrims. At the invitation of the Government of Saudi Arabia, a group of WHO experts on quarantine matters visited the country in 1956 and subsequently reported that the quarantine arrangements at Jeddah were satisfactory from every point of view; they also made some suggestions for further improvements in the health facilities at Mecca and Medina. On the strength of this report and on the advice of the WHO Committee on International Quarantine, the Ninth World Health Assembly decided that the health authorities of Saudi Arabia could deal with all the sanitary problems connected with the Pilgrimage by themselves and therefore abrogated the special provisions of the International Sanitary Regulations. The Assembly nevertheless adopted certain additional regulations specifying that pilgrims should be regarded as " persons taking part in periodic mass congregations ", and should be subject to the same measures as applied to migrants and seasonal workers. This means that the States concerned will arrange for the screening and immunization of such persons before departure and will require adequate standards of hygiene and accommodation in the ships and aircraft in which they travel. The Mecca Pilgrimage of 1957 was the first for 65 years that was not subject to special international legislation.

Vaccination

While vaccination is undoubtedly less effective in checking the spread of cholera than the sanitary measures already described, it has the merits that it can be undertaken rapidly to deal with an emergency and can be used as an interim measure in areas where the standard of sanitation is not yet satisfactory. Perhaps its value has been most strikingly demonstrated in the case of the great religious fairs of India, to which reference has been made previously. In spite of elaborate sanitary precautions at the places where the fairs were held, severe epidemics occurred almost every year, for there was no control along the routes by which the pilgrims travelled and some of the religious observances at the fairs involved unhygienic practices. Compulsory mass inoculation of the pilgrims against cholera was first advocated by Rogers in 1926, but was dismissed as impracticable by the public health authorities, who feared that such measures might be regarded as interference with the religious customs of the people and lead to riots. At the next two Kumbh fairs in 1927 and 1930 disastrous epidemics of cholera occurred. In 1936, an epidemic began to develop in Bombay Province at a time when the pilgrims were already on their way to the Pandharpur fair. The authorities decided to resort to compulsory vaccination of the pilgrims before admitting them to the fair. The results were so satisfactory that vaccination was made compulsory also for other fairs in the province, after which no further outbreaks occurred there. Impressed by the success of these measures, the Indian Central Advisory Board of Health in 1940 recommended that trials of compulsory vaccination should be undertaken in other parts of the country. The gigantic task of inoculating the pilgrims

to the fairs in the United Provinces was first attempted in 1945 and, according to Rogers, the number of compulsory inoculations performed rose from 5 600 000 in 1940 to between 20 and 28 million annually in the years 1945-1951. The cholera mortality at the Hardwar Kumbh fair of 1950 showed a 92-fold reduction as compared with the average figure for the previous seven Kumbh fairs, and during the Allahabad Kumbh fair of 1954, cholera mortality showed a 39-fold reduction in Bihar and Orissa and a 69-fold reduction in the United Provinces compared with pre-inoculation figures. Banerjea has recorded that only 11 cases of cholera occurred in connexion with the 1950 Kumbh fair. All were detected and isolated, and no secondary outbreak resulted, either in the United Provinces or in the adjoining provinces.

Although improvements in sanitation and other factors may have been partly responsible for this remarkable decrease in cholera mortality, the change took place so suddenly as to leave little doubt that most of the credit was due to the mass vaccination programmes. All the same, vaccination suffers from many disadvantages as a means of controlling cholera. It is successful only as long as a high herd immunity can be maintained, but as the duration of the immunity is only 6-12 months, frequent revaccination is necessary. To keep the entire population in a satisfactory state of immunity would demand a tremendous organization and legislation to make revaccination every six months compulsory, a measure that would obviously meet with the strongest opposition. Moreover, there is always a certain percentage of non-reactors on whom vaccination fails to confer protection. It has been claimed, however, that if about 70% of the population is successfully inoculated at the start of a cholera epidemic, this suffices to bring the outbreak quickly under control.

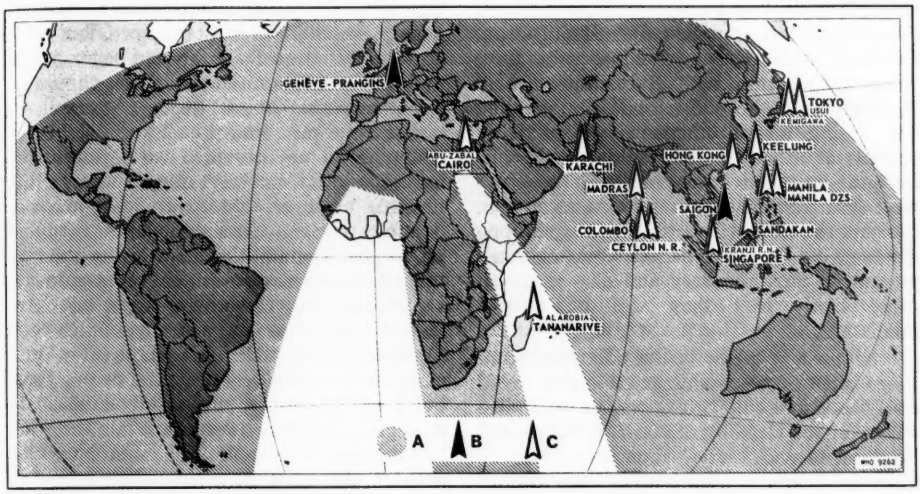
Another difficulty in regard to vaccination is that of standardization of the vaccines. This is particularly important in emergencies created by the sudden flare-up of epidemics, when large quantities of vaccine have to be obtained at short notice from many different sources. The problem was brought acutely to the attention of WHO at the very outset of its existence by the 1947 cholera epidemic in Egypt. With the assistance of WHO, the Egyptian health authorities obtained supplies of vaccine from various countries, but as these were prepared from different strains of cholera vibrio they varied in potency and therefore in dosage. The WHO Expert Committee on Quarantine, which met to consider the problems arising out of the epidemic, urgently requested the WHO Expert Committee on Biological Standardization to investigate the standardization of cholera vaccines. Following a collaborative study organized by the Statens Seruminstitut, Copenhagen, this Committee established International Reference Preparations of cholera vaccine in 1954.[3] Further studies are now envisaged with the aim of obtaining improved international reference preparations of proved efficacy. Requirements for cholera vaccine have recently been drafted by a special Study Group set up by WHO.[4] These requirements are necessarily provisional, particularly in regard to potency tests, and it is recognized that future revisions will have to be made in the light of the proposed further studies. Nevertheless, they should lead to a much greater uniformity in the manufacture and testing of cholera vaccines than has hitherto been the case.

Epidemiological intelligence

To enable quick and effective international action to be taken to avert the threat of epidemics, the International Sanitary Regulations require national health administrations to notify WHO by telegram or by air mail of the appearance of quarantinable disease within their territory and of its continued presence. The information received is collated by the four WHO quarantine and information services at Geneva, Washington, D.C., Singapore and Alexandria. World-wide radio bulletins giving the latest epidemiological situation are sent out daily from Geneva; weekly bulletins are also transmitted from stations at Singapore and Alexandria (see

[3] *Wld Hlth Org., techn. Rep. Ser.*, 1954, **86**, 7.
[4] *Wld Hlth Org. techn. Rep. Ser.*, 1959, **179**.

STATIONS TRANSMITTING WHO RADIO-TELEGRAPHIC EPIDEMIOLOGICAL BULLETINS



A = *Areas reached by Genève-Prangins (Geneva) Station.*
B = *Stations transmitting daily.*
C = *Stations transmitting once or twice a week.*

map). The *Weekly Epidemiological Record*, a publication originated by the League of Nations, is sent by air mail from WHO Headquarters, Geneva, to health administrations, and quarantine and health officers, confirming the broadcast information and giving, in addition, the notifications of quarantinable diseases, as well as information about the application of international sanitary legislation, and notes on the incidence of such non-quarantinable diseases as influenza and poliomyelitis. Weekly reports are also published by the WHO Epidemiological Intelligence Station in Singapore, the WHO Regional Office for the Eastern Mediterranean in Alexandria, and the Pan American Sanitary Bureau in Washington, which acts as the WHO Regional Office for the Americas. These provide epidemiological information of particular interest to health administrations and quarantine officers in Asia; Africa and the Mediterranean countries; and the Americas, respectively.

Management of epidemics

The measures thus far discussed are aimed mainly at reducing the level of endemicity in the endemic areas and preventing the infection being carried to other parts of the world. The management of epidemics when they do arise is largely a matter for national rather than international action, although international assistance through WHO, particularly with regard to the supply of vaccines, is often provided for stricken countries. Apart from rapid vaccination of the threatened population, other important measures include early detection and isolation of cholera patients and suspects, temporary improvement of water supplies, and control of food and drinks. In the areas threatened by epidemics, health education of the public plays an essential role: not only must they be urged to have themselves vaccinated, but they should be taught to recognize the clinical appearances of cholera and it should be

impressed on them that rapid isolation and treatment are of the utmost importance for saving the lives of cholera sufferers and for protecting their contacts against infection. In rural areas, it is a good idea to have " segregation cottages " in readiness where patients can be housed temporarily, pending the setting up of emergency hospitals in schools or other suitable buildings. Mobile hospital units for equipping such hospitals have been found very useful. At all events, patients should not be transported over long distances to hospital because this is detrimental to their recovery and also makes it more likely that they will be refused admission.

Another aim of the health education campaign must be to encourage people to avoid cold foods and cold drinks and to use boiled water for the cleaning of cooking, eating and drinking utensils. They should be urged to keep food and drinking-water supplies, as well as eating and drinking utensils, in fly-proof containers or under screens, and to help combat the fly nuisance and keep their houses in a sanitary condition. During cholera epidemics, it is desirable that the sale of cold foods, particularly such articles as raw fish, salads, jellies and cut fruits, should be prohibited, and that food markets, food shops and eating places should be subject to careful supervision to ensure that this regulation is observed and that the establishments are kept in a sanitary condition—in particular, free from flies. Although DDT and other insecticides have been used with considerable success in recent years in combating flies during cholera epidemics, the real solution to the fly problem lies in the proper disposal of garbage and human faeces. Where this is not possible, as is most often the case in rural areas, the application of larvicides to manure heaps, latrines, and garbage is recommended. The dead bodies of cholera victims must also be kept in fly-proof morgues or else treated with larvicides or disinfectants; sometimes a layer of quicklime is placed in the coffin before putting in the body of the victim.

Every attempt must be made during epidemics to extend the supply of safe water-works water to everyone, regardless of financial situation. This can be done by means of water-wagons or, better, by temporary installation of standpipes, but it is important that no charge should be made and that the water from the standpipes should be freely available at all times. Attempts to install temporary water purification plants for communities not provided with waterworks have not so far met with much success. It is possible, however, that use could be made of floating water-purification plants mounted on barges. The addition of chlorine solution to buckets of water drawn from contaminated supplies has proved to be a simple but satisfactory procedure in some circumstances. Disinfection of wells with potassium permanganate was widely practised at one time, but it suffers from several disadvantages and its efficacy has been questioned. On the other hand, chlorination of wells with bleaching powder appears to be highly effective and of great value in cholera control, although there is still disagreement regarding the dosage to be used. It may be mentioned here that, in places such as Calcutta, the river water is so highly contaminated that the level of chlorination required to sterilize it would render it unpalatable.

Prospects for eradication

As far back as 1949, the Second World Health Assembly expressed the view that world-wide eradication of cholera was feasible and must be aimed at; it suggested that, as a first step, two WHO teams of experts should be sent to the endemic areas of Bengal to demonstrate the most efficient modern methods of control.[5] This policy was endorsed by a Joint OIHP/WHO Study-Group on Cholera which met later the same year in India to make an on-the-spot appraisal of the epidemiological situation in the endemic areas.[6] As part of the proposed programme of research WHO granted assistance to the Indian Council for Medical Research for epidemiological and bacteriological investiga-

[5] *Off. Rec. Wld Hlth Org.*, 1949, **21**, 178.

[6] *Wld Hlth Org. techn. Rep. Ser.*, 1950, **18**.

tions on cholera. The results of some of these studies were reported to the WHO Expert Committee on Cholera when it met in New Delhi in November 1951, in joint session with the Cholera Advisory Committee of the Indian Council of Medical Research. The Committee stressed the importance of a general programme of environmental sanitation in the campaign against cholera and particularly urged local authorities in the endemic areas to study " the use of methods applicable with local materials and at a cost within the economic possibilities of the areas concerned ".[7] Such measures have undoubtedly been playing their part in bringing down the incidence of cholera in India, particularly in the rural areas, but more ambitious schemes will be needed before cholera can be eradicated.

The Central Expert Committee of the Indian Council of Medical Research on Smallpox and Cholera, at a meeting in 1959, called for an all-out effort to eradicate cholera, starting with two major endemic areas, one extending some 10 miles south and 40 miles north of Calcutta and the other in Orissa, around Puri and Cuttack. The Committee advocated that improvements in environmental sanitation, including the provision of safe drinking water on a permanent basis, should be combined with vaccination, disinfection of water supplies, and health education. Action along these lines had already been taken in the Cauvery delta as the result of a visit by a team of WHO experts in 1950, and the Committee believed that if these measures were adopted in the two key areas the total picture of cholera in the rest of the country would be materially improved. It was suggested that district anti-epidemic committees should be set up and that each state should have its own epidemiological unit to keep cholera under continuous study. Before such a programme can be started, pilot projects will obviously have to be undertaken to assess the cost and the staff required, but the Committee recommended that the health education of the people should begin at once so that their full co-operation in the programme would be ensured from the start.

In short, it may be said that the eradication of cholera will demand a radical improvement in environmental sanitation in the endemic areas. Attention has already been drawn to the tremendous cost of such an undertaking, and it seems that it will be impossible without financial help from more fortunately placed countries. This problem has to be seen, in fact, in the broader context of the world-wide improvement in environmental sanitation in the developing countries envisaged by the Twelfth World Health Assembly. Many of the delegates to that Assembly expressed concern over the serious health problems arising from the inadequacy of the water supplies and sewage disposal facilities in their countries. The delegate of India suggested that an exhaustive survey should be made of the water requirements of each country and a systematic plan evolved to meet these requirements within the not too distant future.[8] The Assembly pledged WHO support for the projects of Member States " to provide adequate and safe supplies of water to inhabitants of their communities " and authorized the Executive Board to accept contributions " for the purpose of providing assistance to governments in planning, preparing for and providing other technical assistance in the development of community water supply . . . ".[9]

The countries best placed to give this assistance are those least vulnerable to cholera epidemics, since they already enjoy a high standard of environmental sanitation. The prospects for eradication of cholera thus depend on the disinterested generosity of these more favoured countries and on a continuing spirit of international collaboration.

[7] *Wld Hlth Org. techn. Rep. Ser.*, 1952, **52**, 11.

[8] See *WHO Chronicle*, 1959, **13**, 290.

[9] *Off. Rec. Wld Hlth Org.*, 1959, **95**, 42 (WHA12.48).

ECOLOGY OF ARTHROPOD-BORNE VIRUSES

Until an arthropod-borne virus has been isolated and characterized—emphasized a WHO Study Group on Arthropod-Borne Viruses that met in Geneva in September 1960 [1]—little progress can be made in elucidating the etiology of the disease it causes or in defining the natural cycle of the virus. The investigation of a previously unexplored area for these viruses will thus usually include an examination of human or other vertebrate blood (or both) for antibodies, ecological examination of the area implicated by the serological results, and attempts to isolate the causative virus or viruses.

Outbreaks of arthropod-borne virus disease in man may be sudden in onset and limited in duration, and at the end of the epidemic the virus may sometimes disappear from the affected area. As a contribution to an explanation of this epidemiological phenomenon the Study Group drew attention to Pavlovsky's study of the focal character of zoonoses requiring both an invertebrate vector and a vertebrate definitive host.[2] According to Pavlovsky, a disease, especially a disease that is dependent for its transfer from one definitive host to another on some invertebrate parasite of that host has, just like an animal, a habitat in which, in association with other species, it forms a biocenose within an ecosystem.[3] The natural habitat of such a disease is in a defined ecosystem in which the definitive host, the parasitic vector or vectors, and the pathogen itself are part of the biocenose in which the pathogen circulates. "Landscape epidemiology", as Pavlovsky calls it, emphasizes the fact that landscape is epidemiologically important because its characteristics are those of a particular type of ecosystem.

When man becomes involved in an ecosystem that contains a nidus of a zoonosis, he is liable to become involved in the cycle of the disease and so infected. Often he will alter the environment, and in altering it eliminate the nidus. But he may—by installing an irrigation system, for example—extend the area suitable for the biocenose responsible for the enzootic survival of the disease, and so extend the disease and increase its importance.

One of the participants in the meeting of the WHO Study Group on Arthropod-Borne Viruses, Dr J. A. R. Miles, Professor of Microbiology, Medical School, University of Otago, New Zealand, considered some of the more important and most investigated arthropod-born virus diseases in the light of Pavlovsky's theories.[4]

Although something is known of the conditions required for the development of epizootics and epidemics of arthropod-borne viruses—Dr Miles emphasizes—it cannot yet be stated with certainty what particular circumstances inevitably produce an epidemic. Even less is known about the factors governing the survival of these viruses between epidemics: while it is difficult to explain at times why the viruses fail to survive under certain ecological conditions, at other times it is difficult to understand how they succeed in surviving from one season to the next. To throw some light on these questions, consideration must be given to the habitat of the infection, including the climatic conditions under which it may survive; the nature of the vectors and their relationship to the virus; and, finally, the nature and habits of the reservoir host or hosts.

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1961, **219**.

[2] Unpublished working document EURO-85.2/20 Rev. 1.

[3] The Study Group defines "biocenose" as a *species-network*, the mutually connected assemblage of living species within the "ecosystem", which is a particular geographical and climatic area together with the whole community of living organisms, both plant and animal, living in that physical environment.

[4] Unpublished working document WHO/Arth. Virus Dis./22.

Yellow fever

Boshell [5] has described the four types of habitat in which sylvatic yellow fever may exist:

1. A forest system vast enough to permit the existence of a permanent epizootic, such as the immense jungles of the Orinoco and Amazon basins.

2. Forest zones along river banks, at the foot of mountains, or in valleys directly linked with a habitat of type 1 and invaded periodically. Examples of this type of habitat are to be found in Brazil, Paraguay, Argentina and other South American countries.

3. Forest zones separated from type 1 and 2 habitats by some geographical feature, but liable to invasion at periods when a sudden conjunction of favourable factors occurs. Such zones occur in western Panama and other countries of Central America.

4. Ecological pockets, of which the origin is at present obscure and in which there is sometimes only a small monkey population.

In the great rain forest areas sylvatic yellow fever is a disease of the forest canopy, the community involved being that of the tree-top mosquitos and tree-top monkeys. While the monkeys are very likely to become infected by mosquitos harbouring the virus, man is not readily brought into the cycle. But other mosquitos may become infected from time to time, and it is suggested that these transmit the infection to man. A vast epizootic can easily be maintained in the forest canopy, the virus slowly passing through the forest in groups of susceptible monkeys which infect further vectors as they move about. Type 2 habitat is invaded either by infected monkeys or by infected mosquitos from the type 1 habitat. The occasional invasion of the isolated forest ecosystem of type 3 may be due to mosquitos being blown there during periods of high wind, this being a more likely cause than distant migration of monkeys.

The survival of the virus in habitats 1 and 2 is easily understood, but further consideration must be given to types 3 and 4. With regard to type 3, which Boshell regarded as typical of Central America, the disappearance of yellow fever in Central America round about 1925 is harder to explain than its reappearance in sylvatic form in 1948, when the disease spread as a typical monkey epizootic, causing a large number of deaths among howler monkeys and also affecting spider monkeys, although to a lesser extent. Why did yellow fever apparently disappear completely in 1925, when there was a large population of susceptible monkeys and adequate numbers of efficient vectors of the genus *Haemagogus*? The most likely explanation is that the disease was present only in the urban form at that time and was spread by the cycle man-*Aëdes aegypti*, monkeys never having been affected. If this theory is correct, the failure of the virus to spread to monkeys in Central America may at least be partially explained by the differences between the ecology of *A. aegypti* in America, where the mosquito is strictly domestic, and its ecology in Africa, where, in addition to being domestic, it is found in the forest canopy.

The basic problem of habitat type 4 is the survival of the virus in the absence either of a substantial monkey population or of widespread infection among monkeys. Investigation in America of the existence of infection in animals other than monkeys has revealed the susceptibility of marsupials, kinkajous (*Potos*) and olingos (*Bassaricyon*).

In Africa, special attention has been paid to bush babies (*Galagos*), particularly in those areas where monkey infection is rare. A high proportion of *Galagos* gave indefinite results in neutralization tests with yellow fever virus. A similar situation has been observed in a human population heavily infected with Chikungunya virus. This problem has recently been investigated in rats infected with Semliki Forest virus. When pregnant rats were infected towards the end of the gestation period, in quite a proportion of cases the young were born alive. These suckling rats, infected *in utero*, did not produce a normal antigen-antibody response to the virus until they had reached an average age of 14 weeks. In some cases, they would

[5] Boshell, J. (1957) *Bull. Wld Hlth Org.*, 16, 431.

also circulate virus for considerable periods when reinfected after the age of maximum susceptibility to the virus. It therefore seems possible that these animals acquire a degree of tolerance to the virus as a result of intra-uterine exposure, and may circulate it for longer periods than is usual, thus becoming particularly good reservoir hosts. A mechanism of this kind might make the bush baby of especial importance in the perpetuation of enzootic foci of yellow fever in areas where simian infection is rare or the monkey population small.

Other tropical forest virus diseases

The other viruses isolated from wet tropical areas seem likely to be similar in their ecology to the yellow fever virus, but none has been so much studied and we know much less about them. In tropical areas where there is a monsoon season of heavy rain and a dry season, the situation is different from areas in which there is a heavy rainfall throughout the year: the nature of enzootic foci of arthropod-borne viruses is more clear-cut and the season of the incidence of maximum infection is better defined. An example is Kyasanur Forest disease, which appeared in Mysore State in South India, in 1955. This disease has a cycle involving mainly ticks and monkeys, with man quite commonly becoming infected; the chief vector appears to be the tick *Haemaphysalis spinigera*. Human cases begin to occur in the dry season when ticks become active and monkeys dead from the disease are found in the forest. At the onset of the monsoon outbreaks begin to fall off *pari passu* with the decline of the ticks' activity.

Dengue

The only known transmission cycle of dengue viruses one and two is the direct man-mosquito cycle, and it is therefore hard to explain the survival of the virus, particularly in sparsely populated areas with a relatively small influx of new susceptibles. A certain amount of serological evidence suggests, however, that dengue virus has an animal reservoir. Thus, dengue antibodies have been found in a range of domestic and wild animals in Malaya, while in Australia similar antibodies have been found in flying foxes of the genus *Pteropus*. From an epidemiological point of view the theory that flying foxes may be important reservoir hosts of dengue virus is very attractive, since it would explain the endemic survival of the disease in areas such as Northern Australia, the Fiji Islands and Samoa, where the human population is small but the population of fruit bats is large. On the other hand, a theory such as that proposed for Chikungunya virus in man and for yellow fever virus in the bush baby might also be applicable in the areas where dengue is highly endemic.

Phlebotomus fever

The only known cycle for the transmission of phlebotomus fever virus is between the vector midge (*Phlebotomus papatasii*) and man. *P. papatasii* is active during the summer months and breeds in cracks in the ground and walls around human habitations where there is suitable humidity and abundant organic debris. Under optimum conditions, the life-cycle lasts 4½-6 weeks. The insect disappears completely during the winter months, hibernating in the fourth larval stage. Although some evidence exists that in certain circumstances the infection can be passed from one insect to another by transovarial transmission, it appears certain that the larvae normally become infected by feeding on the excreta or dead bodies of infected adult midges. It should be borne in mind that only an occasional infected midge would be needed for the virus to multiply, provided that there were an adequate supply of susceptible hosts.

Mosquito-borne encephalitides [6]

Much attention has been paid to the conditions required for the survival of the North American mosquito-borne encephalitides,

[6] Miles has discussed the inter-epidemic survival of mosquito-borne encephalitides in a recently published article (*Bull. Wld Hlth Org.*, 1960, 22, 339).

which disappear completely during the winter season, when the mosquitos are inactive. The theory that migratory birds reintroduce the infection each spring from tropical areas—a theory that was postulated in the case of Murray Valley encephalitis epidemics—has not been definitely proved. The possibility that the virus survives in the epidemic areas in a latent form during the winter season, particularly in hibernating mosquitos, must therefore be considered.

The field observations have been mainly confined to western equine encephalitis virus (WEE) and St Louis encephalitis virus (SLE). The former virus has repeatedly been isolated in *Culex tarsalis* collected during the winter, while the latter virus, apart from one isolation in March, has been isolated in *C. tarsalis* only between June and September. Laboratory experiments in which *C. tarsalis* was fed WEE-infected blood and *C. pipiens* and *C. quinquefasciatus* were fed SLE-infected blood have shown that the viruses in question survived for lengthy periods when the insects were placed under conditions of hibernation. The period of survival increased to 100 days when the mosquitos were made to hibernate immediately after feeding.

Transovarial transmission of Japanese B encephalitis (JBE) has been reported in *C. pipiens* and *Aëdes albopictus*. Experiments carried out with WEE and SLE viruses in *C. tarsalis* gave negative results.

There is no evidence that these viruses can multiply in mites, or that mites play any part in their transmission.

Experimental evidence exists that JBE virus can be transmitted by *C. pipiens* to three species of insectivorous bat. The infection was maintained in the big brown bat (*Eptesicus fuscus*) for 107 days under conditions of hibernation; three days after their return to normal conditions, the bats had sufficient virus circulating in the bloodstream to infect mosquitos. It is possible, therefore, that JBE virus can survive during the winter in caves harbouring both hibernating bats and mosquitos. Since the spread of infection would require the existence in the spring of only a very small proportion of infected mosquitos, such a mechanism might prove to be of great importance in the survival of this virus, although there is no direct evidence that the cycle is effected under natural conditions.

Attempts to infect sparrows with SLE virus and hens with Murray Valley encephalitis virus have met with failure. On the other hand, in the experimental infection with WEE virus of a series of 284 birds belonging to 9 different species, 8 isolations were obtained in birds belonging to 5 species during a period lasting 55-306 days after the initial infection. These results suggest that, at least as far as WEE virus is concerned, latency in birds may be an important factor in survival.

It has been found that *C. tarsalis* commonly spends the winter in rock piles, which are also the hibernation place of many snakes. Moreover, laboratory investigations have revealed that *C. tarsalis* feeds on garter snakes (*Thamnophis* spp.) in the absence of other hosts. Snakes bitten by mosquitos infected with WEE virus show viraemia for a period of 4-20 days, and of up to 36 days when inoculated with virus by the intraperitoneal route. These interesting observations suggest the existence of yet another ecological situation in which the WEE virus would be able to survive during the winter.

Tick-borne viruses

There appears to be little difficulty in explaining the survival of tick-borne viruses in vectors as long-lived as ticks. It is clear that a tick infected during the larval or nymph stage can harbour the virus from one season to the next and infect the animals on which it will feed. Transovarial transmission has also been observed, in some cases, in the species *Ixodes persulcatus* and *I. ricinus*. The work that has been carried out does not exclude the possibility of this method of transmission in other tick-borne viruses, although there is little evidence of it.

* * *

Thus, enzootic foci of arthropod-borne virus diseases may be found in a variety of ecosystems in differing climatic conditions, the ecosystem depending on the habitat preferences of the main vectors of the virus, and

the enzootic focus being associated as a rule with particular communities within the ecosystem rather than with the biocenose as a whole. In tropical rain forest the main enzootic foci are in the forest canopy, because it is there that the greatest concentrations of susceptible vertebrates and mosquito vectors are to be found. In areas where there are wet and dry seasons, mosquito-borne disease is usually at its maximum in the wet season, and at times would appear to be associated with a bird-mosquito cycle; during the dry season, however, tick-borne disease has its maximum incidence. In dry tropical and sub-tropical areas with a short rainy season, there may be small well-defined swamp areas that provide the enzootic foci; in these a larger proportion of vertebrate species may be involved in the cycle than is usual in other climatic regions. Finally, in temperate areas some mosquito-borne viruses may multiply in colonies of nestling birds, especially of water birds in the neighbourhood of large mosquito breeding-grounds.

ORIGIN AND EVOLUTION OF THE TREPONEMATOSES

Although the treponematoses are a group of closely linked diseases, they are distinguished from one another by their epidemiology and geographical distribution. A theory about their origin and development has been put forward by T. A. Cockburn in a recent paper in the WHO Bulletin.[1]

According to this theory, all parasites are descended from free-living forms. The original ancestors of the treponemes must therefore be sought in the soil or water. But do such ancestors still exist? This is unlikely, but at least some of their free-living descendants may still survive with the same basic characters. The genus *Spirochaeta* of the family Spirochaetaceae is free-living in water, and is obviously very adaptable since many species are found in a wide range of habitats. In this genus, therefore, there is no lack of free-living organisms resembling the treponemes morphologically and presenting characters that may be those of their ancestors.

The development of symbiosis between the free-living forms of these unicellular organisms and the larger animals undoubtedly took place millions of years ago, the skin and the orifices of the bodies of animals living in close contact with the soil or water probably being the first sites to be occupied. It is unlikely that these organisms began by being pathogens; in all probability parasite variants of the commensals slowly evolved in a number of different animals and in various orifices until there developed the families, genera and species known today. Did man inherit his treponemes from his remote primate ancestors? If so, they should be found in monkeys today, though not necessarily as pathogens. Or was he infected by contact with other animal species harbouring these parasites? Our knowledge of the distribution of treponemes in nature is still too scanty to provide an answer to these questions.

It is generally accepted that there were treponemal infections before the days of Columbus, both in the Old World and in what was to become America. Ancient bones bearing traces of treponemal lesions have been discovered in various parts of the Old World, and there is little doubt that pinta has existed in Central America for many centuries.

What is the link between these treponematoses? In the absence of evidence favouring one theory or another, it is only possible to speculate. In the Ice Age, the sea-level was much lower than it is today, and it was easier for surface migrations to take place from one part of the world to another, for example, across the land bridge—now the Bering Strait—linking Asia to America. During this period, man wandered over the planet, taking his parasites, including the treponemes, with him. Like him, these parasites adapted themselves to various climatic conditions,

[1] *Bull. Wld Hlth Org.*, 1961, **24**, 221.

and new strains and species appeared. The rise in sea-level at the end of the Ice Age greatly accentuated the separation of these species, by isolating human groups as well as their commensals and parasites. The Bering Strait separated Asia from America, and Australia was cut off from Asia. The British Isles, Ceylon and the Malay Archipelago were formed. The result of the thousands of years of isolation thus imposed on human communities and their parasites, it is suggested, was that the various human races differed in their reaction to the treponemes infecting them. The pathogens themselves also produced differences, so that the picture of treponemal disease naturally varied—and varies—in different parts of the world.

Pinta—to take one of the treponematoses —seems a particularly good illustration of the consequences of geographical isolation. Not only is this treponematosis limited to a single area—Central America—but the organism causing it differs from the treponemes in other parts of the world and human reactions to it are of a special kind.

This differentiation is not limited to the treponemes. A similar differentiation took place between species of body lice: those infesting the white races differ from the others; those of the American Indians resemble those of the yellow races to some extent; and African lice are black and only half the size of the lice in Europe.

The coexistence of yaws and syphilis in the temperate zones today suggests ecological as distinct from geographical separation. There is no geographical barrier separating these two infections. In certain areas where syphilis is found there also exists a non-venereal, yaws-like treponemal infection. In endemic yaws regions, groups with high standards of living rarely contract yaws, but can on the other hand contract syphilis. Being a very delicate organism, the treponeme cannot exist for long away from its human host, and its subsistence depends on direct transmission from body to body. In warm climates where few clothes are worn and not much attention is paid to hygiene, frequent cutaneous contacts are sufficient to maintain an infection like yaws. But when clothing prevents such contacts and hygiene is better, only the parasites depending on venereal transmission survive. The difference in density between modern and ancient populations must also have affected the character of the treponematoses, if—as Cockburn suggests —the infectious diseases tend to be chronic in small populations and acute in large ones. More highly pathogenic strains appear to have established themselves in populations increasing in density with the development of settled communities and the domestication of animals. This would explain why a chronic infection such as pinta survived in a continent that at the time of Columbus had no more than 8 million inhabitants. Yaws became an acute infection, because it developed in a dense population—in West Africa alone, the population at the time of Columbus was the same as that of the two Americas.

In Europe, it is probable that improved hygiene and advances in knowledge, from the 16th century on, changed the conditions for the transmission of the treponematoses. This would explain why a venereal strain has persisted, while treponematoses depending on cutaneous transmission have died out. Cockburn suggests that the solution to the much discussed problem of whether syphilis was introduced from the New World is that, because of the improvement in standards of living and hygiene during the Renaissance, " those treponemes in the temperate zones that depended on direct skin to skin transmission were at a biological disadvantage and largely died out. Those that would survive would be the hardier saprophytes and a strain that had developed venereal transmission. Such a venereal strain . . . would not emerge as a distinct entity so long as it was not isolated from the other treponemes, for it would interbreed with them and lose its identity. Once the others were out of the way, syphilis in its modern form would appear. In this concept, the relationship of the discovery of America and the first appearance of syphilis would not be that of cause and effect, but both would be consequences of one common factor, the Renaissance and all the increase of knowledge and wealth of that time."

Syphilis is distinguished from the other treponematoses by the fact that it can infect the foetus and cause lesions of the internal organs, including the central nervous system. Cockburn suggests that this seemingly (from the point of view of the treponemes) useless characteristic is the result of the passage of the treponemes through series of foetuses in congenital infection, leading to the appearance of organotropic strains by the influence exerted on the selection of mutants. This suggestion seems plausible when it is remembered that until recently it was quite common for one woman to have a dozen or more pregnancies.

On the basis of their past history, it may perhaps be possible to predict the future development of the treponematoses. With improved hygiene and eradication campaigns, the almost complete disappearance of the cutaneously transmitted treponematoses may be anticipated. There is little hope—despite the efforts made so far—that syphilis will die out. However, its nature may change. More efficient maternal care may cut down the incidence of congenital syphilis and so the viscerotropic and neurotropic forms of the disease. There may remain a superficial form spread among the population by promiscuity and this would lead to the selection of more acute and highly infectious strains. Perhaps, in some fifty years' time, the only surviving treponematosis will be a rapidly spreading mild venereal infection.

POPULATION MOVEMENTS AND MALARIA ERADICATION

In the early months of 1960, a WHO consultant—Mr R. Mansell Prothero—visited the Sudan, Uganda, Kenya, Somaliland, Tanganyika, Zanzibar, Southern Rhodesia, Nigeria, and Ghana to study the effect of population movements on malaria eradication programmes. In his report on this assignment,[1] he observes that, although no method of measuring the extent of population instability has yet been devised, there can be no doubt of the very high degree of such instability in Africa. In fact, " population movements of various kinds are among the most outstanding demographic features of the continent ".

In all the countries and territories visited by Mr Prothero, there are considerable population movements from permanent villages to farms and back again. These usually involve the erection of temporary shelters for the migrants on the farms. In the Sudan, for example, people move from one area to another during the cotton-picking season; in Nigeria, during the dry season, people go to the valleys where there is still water to irrigate the land. Gambia receives many temporary immigrants from neighbouring countries for groundnut cultivation. Cultivation, planting and weeding coincide with the early months of the rainy season when malaria vectors are on the increase, and when temporary shelters provide suitable resting-places for them.

Although the harvesting of such products as groundnuts, cocoa and cotton attracts a considerable amount of labour, in many parts of Africa it occurs after the peak of malaria transmission. The same cannot be said, however, of movements of labour to mining, industrial and commercial undertakings, since these occur all the year round.

Nomadic movements of pastoral tribes —which are on a larger scale than other types of population movement—occur only in certain parts of Africa, such as Northern Sudan and Somalia. Fixed settlements are foreign to the way of life of these tribes; moreover, the environment in which they live compels many of them to wander with their flocks and herds. The only religious movements of any large size are those of West African Mohammedans north-eastwards towards Mecca; these cause some convergence on the Sudan, but do not involve so many

[1] *Bull. Wld Hlth Org.*, 1961, **24** (In press).

people as the internal migrations of the population of the country itself.

Apart from those connected with farming, most of these population movements take place without respect for international or political boundaries. Their effect on the stability of populations is considerable, and in fact all malaria eradication pilot projects now in operation in Africa are hampered by them. It has so far proved impossible to start a malaria eradication programme for a whole country in Africa, because there is not one that contains population movements within its own boundaries. To keep migrants out of an area by using some form of *cordon sanitaire* would not be practicable, because there are so many ways in which an African can get through natural or man-made boundaries if he wishes to do so. International co-operation in malaria eradication—even if fully developed—would be only a partial solution to the problem. These population movements are a fundamental part of the "way of living" of the people. Some, such as pastoral nomadism, are traditional; others, such as migrant labour, are of more recent development. In either case, they cannot within a short time be stopped or easily controlled for, as Prothero points out:

> "These movements are not unchanging but the changes are taking place slowly, and where they are successful they are part of what would seem to be an evolutionary process. Any attempt to push them ahead, say, by legislation, might prove abortive. The fact must therefore be faced that they are taking place at a rate which is too slow to be of any significance for the suggested timetables of malaria eradication."

The situation must be accepted, and if it raises problems in malaria eradication, it will be necessary to find ways of adjusting to it.

Malariologists in Africa must therefore try to circumvent the problems that population movements raise for them in their work. But how, for example, is it possible to deal with the nomad pastoralist whose movements do not appear to follow any fixed plan, and whose huts, being mostly composed of grass and leaves, are not susceptible to effective insecticidal treatment? It is clear that there is no generally applicable solution to problems of this kind, and that each of them must be considered individually on the same level as the malariological and entomological investigations that are now regarded as an essential part of malaria eradication programmes. Population distribution, settlement patterns, types of housing, farming practices, communications, water supplies and other relevant factors vary so much from one area to another that generalization is impossible. Geographical reconnaissance, as it now exists in eradication programmes, does not cover every aspect of population movement. Where necessary, it will have to be expanded to collect much wider information on the factors mentioned above, in order to understand the whole complex of physical environment, malaria parasites, vectors, and people. It may then be possible to evolve the correct technique applicable to each individual local situation. The inclusion of professional geographers in some malaria teams for full-time work at the outset of a programme would be valuable; when they had collected the required information, it would not be necessary to retain their services, since the geographical data could afterwards be kept up to date by a specially trained sanitarian.

It has sometimes been stated that malaria projects in Africa have covered too limited an area not to be adversely affected by population movements, and that the problem might be considerably reduced by enlarging the area of operations. While this might be true of certain areas where nomadic or agricultural movements occur, it does not apply to the movements of labour for industry and commerce, which cross so many boundaries that a very large project indeed would be needed to contain them. In Uganda, the natural barriers formed by Lake Victoria, the Rift Valley wall, and difficult country to the north and north-east tend to direct travellers along definite routes, but elsewhere it would be difficult to channel these movements of labour so as to be sure of applying effective chemotherapy or chemoprophylaxis. This confirms the need for detailed individual study of every migration problem arising in the course of malaria eradication in tropical Africa.

Notes and News

Fluorescent antibody techniques

Since the establishment of the antigen-antibody theory, bacteriologists have been faced with the problem of tracing antibodies in the organs and tissues. Metchnikoff (1897) and Bieling & Gottschalk (1923) tried tetanus and diphtheria toxins as markers, inoculating sensitive animals with minced sections of toxic organs from other animals. Later on, Haurowitz and his co-workers (1932 and 1936) used chemical markers—horse serum coupled with diazotized arsanilic acid or iodinated horse serum. Subsequently, improved markers were used—colouring matter, and then radioisotopes (^{32}P or ^{131}I).

From 1930 onwards, particular attention was paid to the conjugation of antibody proteins with simple chemical compounds, without destroying their capacity to react specifically with antigens. In 1942, following the discovery of the reaction of aromatic isocyanates with proteins, Coons proposed a method of detection by fluorescence (conjugation of the proteins with fluorescein isocyanate), using it first of all to locate pneumococci in mouse tissue.

These steps in the development of antibody detection are recapitulated by F. Borek in a recent article in the WHO Bulletin,[1] which describes the fluorescent antibody technique in detail, emphasizing that Coons and his co-workers "produced a technique which can be used to show that antigens associated with a given disease are actually present in certain tissues that are regularly involved, and are absent or in smaller amounts in unaffected tissues".

Since 1950, the fluorescent antibody technique has found many applications in the detection of pathogenic antigens, in the tracing of hormone-producing cells, and even in the antigenic differentiation of malignant from normal tissues.

In 1959, Goldwasser et al.[2] showed the value of this rapid and specific technique in the diagnosis of rabies. Supplanting the lengthy virus isolation test, the fluorescent technique makes it possible to examine the tissues of animals suspected of being rabid on the same day as they arrive in the laboratory, and to decide whether it is necessary to vaccinate the person who has been bitten or not. This is a highly important decision because of the pain and discomfort that accompany this vaccination. In 1960, a WHO Expert Committee on Rabies[3] stated that it wished "to encourage rabies diagnostic laboratories to develop proficiency in carrying out this test in order that further comparative studies can be done with this and other diagnostic tests". It went on to point out that "exacting standards of performance, equipment and reagents are necessary, and these are related to adequate training and proficiency of the diagnostician as well as to the quality of the reagents and equipment employed".

In another recent article in the WHO Bulletin,[4] W. E. Deacon describes the advantage of the fluorescent antibody technique in epidemiological studies of gonorrhoea. This new development is based on the discovery, in the gonococcus, of a K antigen similar to that described for the meningococcus. This antigen is labile and is not found at every stage of the life of the gonococcus. In very young cultures it is not fully developed, and it has disappeared by the time a culture is more than 30 hours old. On the other hand, it is fully developed in the gonococci occurring in infectious exudates. It is at this stage that it can be clearly identified by the fluorescent antibody technique, and a rapid diagnosis can be made. Gonococci from male urethral smears in possession of K antigen are stained solidly and brilliantly by fluorescein-labelled antiserum.

Detection of the gonococcus in females by the fluorescent antibody technique presents difficulties, mainly because of the small number of gonococci present. A technique of specimen enrichment has been perfected; this makes it

[1] *Bull. Wld Hlth Org.*, 1961, **24**, 249.
[2] *Bull. Wld Hlth Org.*, 1959, **20**, 579.
[3] *Wld Hlth Org. techn. Rep. Ser.*, 1960, **201**, 6.
[4] *Bull. Wld Hlth Org.*, 1961, **24**, 349.

possible, after an incubation period of 16-24 hours, to apply the fluorescent method to heavy smears. Though known as the "delayed" method, it nevertheless reduces the time required for diagnosis—from 3 to 10 days with the conventional culture technique.

A new step in the diagnosis of rheumatic fever

"Infection with Group A haemolytic streptococci is now recognized as the only established inciting factor in acute rheumatic fever... Therefore, the practical problem of rheumatic fever prevention remains one of the prevention and treatment of streptococcal infection," states the second report of the WHO Expert Committee on Rheumatic Diseases.[1] Further on in the same report, it is said that: "The determination of the antistreptolysin [antihaemolytic antibody] titre is of considerable value in the diagnosis of those cases of rheumatic fever in which the demonstration of the occurrence of a preceding streptococcal infection is crucial."

However, the results of tests for this purpose vary considerably in different parts of the world, and comparison is difficult unless methods are standardized. As an essential step in this direction, the WHO Expert Committee mentioned above recommended the establishment of an International Standard for Antistreptolysin-O, i.e., for the antibody neutralizing the haemolysin-O of Group A streptococci, which is inactive in the presence of oxygen and active only in reduced form. Work on the establishment of this standard is described in a recent number of the WHO Bulletin.[2]

The question of a standard for antistreptolysin-O had been under study for a long time. As early as 1932, a unit was proposed by Todd. On the basis of his work, a Danish National Standard was established in 1944; since then it has been widely distributed all over the world. At present about fifty samples are distributed annually.

Following the recommendation made by the WHO Expert Committee on Rheumatic Diseases, the International Laboratory for Biological Standards, Statens Seruminstitut, Copenhagen, was requested by the WHO Expert Committee on Biological Standardization to organize the establishment of an international standard. Twelve laboratories in eleven countries took part in a collaborative assay of a freeze-dried mixture, sealed under vacuum, of highly potent sera derived from three patients suffering from streptococcal complaints. A 1: 10 dilution of the reconstituted serum in buffered saline was found to remain stable, even at 37°C, for at least four weeks. The International Unit for Antistreptolysin-O has been defined as the activity contained in 0.0213 mg of the International Standard. This standard is distributed by the International Laboratory for Biological Standards, Copenhagen, to laboratories requesting it. It is dispensed in the fluid state, in ampoules containing 10 IU/ml. For special purposes, however, it can be obtained freeze-dried in ampoules containing 2150±65 IU.

Health agreement between Peru and Colombia

Over the past few years, WHO has repeatedly emphasized the importance in malaria eradication of ensuring close co-operation between adjacent countries. Thus, in 1957, the Tenth World Health Assembly considered that, "with the progress of malaria eradication programmes in some areas, it becomes more and more desirable that countries bordering on the eradication areas should also either carry out a programme of eradication, or at least cover with efficient control an adequate zone near the borders", and requested the Director-General "to stimulate inter-country arrangements with a view to minimizing the danger of importation of sources of infection".[1] Again, in January 1959, the WHO Executive Board observed that "in many geographical areas of the world mechanisms for inter-country co-ordination of malaria eradication programmes already exist" and that "such inter-country co-ordination becomes increasingly important as national programmes approach the goal of malaria eradication". It urged "all governments

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1957, 126.

[2] Spaun, J., et al. (1961) *Bull. Wld Hlth Org.*, 24, 271.

[1] *Off. Rec. Wld Hlth Org.*, 1957, 79, 33.

concerned to facilitate the exchange of relevant information between neighbouring malarious or recently malarious countries and to collaborate with such neighbouring countries concerning measures to be taken in their frontier zones".[2]

A good example of joint action to solve border health problems, and in particular those concerned with malaria, is the health agreement signed between the Republic of Peru and the Republic of Colombia after a meeting of representatives of the two countries at Iquitos, Peru, in November 1959.

The aims of the agreement are to co-ordinate the malaria eradication programmes in which both countries are engaged, and to develop intensive joint campaigns for the eradication of smallpox and urban yellow fever and the control of jungle yellow fever.

The part of the agreement relating to malaria eradication provides for co-ordination, as regards timing and zoning, of the spraying and epidemiological assessment operations in frontier regions, each country communicating the necessary information in advance to the National Malaria Eradication Service of the other. Arrangements are made for the Malaria Eradication Service of one country to conduct spraying operations in parts of the other, in cases when this would be more convenient. Both services will exchange information on frontier localities or dwellings that still remain unsprayed, and these will be sprayed by the service which can do it most easily within the prescribed time limit. The two services will assist each other in every possible way in the field by making transport, material, equipment, etc. available when necessary and feasible. Provision is made for regular exchanges of all types of epidemiological information and for periodical meetings between the officers in each service responsible for operations in the frontier zones. The establishment of a joint epidemiological map and joint action for the control of migrants from malarious areas are also provided for.

For the control of yellow fever and smallpox, the two countries have agreed to exercise constant vigilance in localities where *Aëdes aegypti* has existed; to intensify vaccination and revaccination against yellow fever and smallpox in frontier areas; to demand certificates of vaccination against yellow fever and smallpox from international travellers, in accordance with the provisions of the International Sanitary Regulations; to adopt as far as possible the same working methods and standards to ensure comparability of results; to use for preference the freeze-dried type of smallpox vaccine and the multipuncture method of vaccination; to exchange laboratory services and supplies of yellow fever and smallpox vaccines as and when either country may need them; and to notify without delay all cases of yellow fever and smallpox in frontier zones.

[2] *Off. Rec. Wld Hlth Org.*, 1959, **91**, 31.

Malaria eradication campaign resumed in Haiti

The Government of Haiti, the Pan American Health Organization (PAHO), the United Nations Children's Fund (UNICEF), and the US International Co-operation Administration (ICA) have signed an agreement for the eradication of malaria in Haiti. A malaria eradication programme was started in Haiti early in 1958, but stopped temporarily in November of that year.

Under the agreement, the Pan American Sanitary Bureau, which acts as the administrative office for PAHO and as the WHO Regional Office for the Americas, will provide two malariologists, a sanitary engineer, and at least one sanitarian for each of the field zones established for the execution of the campaign, as well as fellowships and travel grants for the training abroad of Haitian workers in the programme. UNICEF will furnish supplies and equipment; ICA will provide additional personnel, including an entomologist and a sanitarian, and, jointly with the Government of Haiti, the necessary funds for initiating the programme.

As a result of the malaria eradication campaigns being carried out in the Region of the Americas with help from PAHO/WHO, UNICEF and ICA, an area of more than 10 million km² with a population totalling about 188 million persons was free from malaria by last year. Total eradication has been achieved in Chile, the USA, Puerto Rico, Barbados, and Martinique. The majority of the other nations in the continent are on their way to eradicating the disease.

"Accidents need not happen"

World Health Day is held each year on 7 April to mark the anniversary of the coming into force of the Constitution of the World Health Organization in 1948. The aim of this year's observance was to awaken governments and their peoples to the growing number and seriousness of accidents everywhere, the inadequacy of present preventive measures, and the need for quick action against this scourge of our times.

In a special message for World Health Day 1961, Dr M. G. Candau, Director-General of WHO, stated:

"In the world today, accidents cause more deaths than any single illness except cancer and cardiovascular disease. In many countries accidents kill more children from 5 to 19 than all other causes combined. They take a greater toll in young lives than any war the world has yet known . . .

"Too many people still unthinkingly accept accidents as misfortunes over which the individual has no control. 'Accidents will happen', they say, as if that excused everything. Yet whenever studies are made of accidents in home or school, on the road, in factory or farm, or of any other sort of accident, ways can always be found to reduce their number and seriousness.

"Accidents are not chance events, they do not just 'happen'. Every one of them is the outcome of a chain of causes and most of them can be prevented.

"There is evidence that the majority of accidents happen in situations which are generally thought to be 'safe'. About half of all accidents happen in the home, and children are the principal victims. Two-fifths of all fatal accidents to children between one and four years of age take place in or around the home. Prominent causes are burns and poisoning which, even if not fatal, are generally serious. Yet almost all could be avoided by a little extra vigilance and a few simple precautions.

"A thousand people a day die on the world's roads —half of all accident deaths. Road accidents are the most talked about and most written about of all, yet little is really known of the multiple factors which interact to produce them. In only one or two countries have present prevention measures done more than stop the road accident rate from rising faster than the increase in vehicles or miles driven. Much more needs to be known about the principles underlying road safety.

"Occupational accidents have been more thoroughly studied than any others, and in many industries strict safety regulations are enforced. Notwithstanding this, in the United States of America alone it is estimated that in 1959 the working time lost because of accidents was 220 million man-days . . .

"The best present hope of accident prevention is certainly through safety education. Innumerable accidents are due, at least in part, to some action or omission of the victim himself—the pedestrian who crosses the road without looking; the boy who tries to change a fuse without turning off the current; the workman who fails to observe the factory's safety rules. Safety should, of course, be taught in schools, but also in factories, on the farm, and, perhaps most important of all, in the home."

WHO membership

In a note under the above heading on page 69 of the February number of *WHO Chronicle*, it was erroneously stated that the Federation of Nigeria was admitted to Associate Membership of WHO in May 1960. In fact, the Federation of Nigeria became an Associate Member of WHO in 1956.

Mr B. H. Riley

Mr Bertram Hurrell Riley, F.C.A., Internal Auditor for the World Health Organization, who died suddenly in Geneva on 4 March 1961, had been with the Organization since its foundation in 1948, and had previously worked for the Interim Commission before WHO officially came into being.

Born in 1905 in Kettering, Northampton, England, Mr Riley attended school at King's Lynn. He was articled to a firm of public accountants, studied at the British School of Accountancy, and became an incorporated accountant in 1928 and a Fellow of the Institute of Chartered Accountants in 1960.

Until he took up service with WHO, Mr Riley's professional career was entirely spent with an international firm of accountants. He was stationed in Zurich before joining the WHO Interim Commission in 1947, when he became largely responsible for the organization and supervision of all the accounting operations of WHO in Geneva. Mr Riley became Chief, Office of Internal Audit, in 1950 and held this position until his death.

People and Places

Research on vector control

Mr F. P. W. Winteringham, Head of the Biochemistry Department of the Agricultural Research Council's Pest Infestation Laboratory at Slough, United Kingdom, has been appointed consultant to the Vector Control and Pesticides unit, Division of Environmental Sanitation, WHO Headquarters, in connexion with the expanded programme of research on insecticide resistance and vector control. Mr. Winteringham will advise on the chemical and biochemical aspects of the programme, including the stimulation of research throughout the world, particularly in industrial organizations, and on the preparation, procurement, exchange and distribution of radioactive chemicals and similar materials. He will also ensure liaison between the insecticide-manufacturing industry and the WHO collaborative programme for the evaluation and testing of new insecticides.

Mr J. Keiding, of Denmark, has also joined WHO to take part in the research programme on insecticide resistance and vector control. He will have the task of co-ordinating and stimulating research on vector control, including field studies on the planning and implementation of control methods, with particular emphasis on new insecticides emerging from the WHO programme for the evaluation and testing of new compounds. He will also be responsible for the organization and implementation of studies on the ecology of insects of public health importance and for relating them to the control of the vectors. Mr Keiding is the chief of the section of the Government Pest Research Laboratory, Springforbi, Denmark, dealing with research, testing of insecticides, and advice on the control of insecticide resistance in household pests. He has collaborated with WHO for many years and the Organization has financially assisted his studies on fly control.

Environmental sanitation

A team of three WHO consultants has gone to the Malagasy Republic to advise the Government on a number of sanitary engineering matters. They will spend about five weeks studying the problem of urban water supply in the island, technical problems of water supply in the more arid regions of the south, and the administrative and financial problems involved in programmes for water supply improvement and for the extension of the Tananarive sewerage system.

The team leader and engineer is Mr Maurice Fontaine, Ingénieur en Chef, Département des Ponts et Chaussées, Paris. A graduate of l'Ecole polytechnique, Paris, Mr Fontaine also holds a diploma from l'Ecole nationale des Ponts et Chaussées. He has visited Madagascar before and has also worked in Tonkin and Venezuela. Mr Georges Steyaert, of the Compagnie intercommunale des Eaux, Belgium, is the financial and administrative expert on the team. He is a graduate of the Athénée royale d'Ixelles and was formerly attached to the Belgian Ministry of Health. The third member of the team is Mr Jean Archambault, a specialist in underground waters in arid and tropical zones. He graduated in natural sciences at the University of Paris and holds a diploma from the Ecole nationale supérieure de Pétrole. A former head of the Geological Service of Tunisia, Mr Archambault has taken part in missions to Greece and Cameroun for the Food and Agriculture Organization of the United Nations, and the Commission for Technical Co-operation in Africa South of the Sahara, respectively. Since 1959 he had been engaged on studies in Mozambique for the Portuguese Government.

Maternal and child health

Dr H. M. C. Poortmann, of the Netherlands, has been appointed WHO Medical Officer to the maternal and child health programme in Netherlands New Guinea for one year. In this programme, which has received supplies and equipment from UNICEF, he will advise the appropriate authorities on the general development of the maternal and child health services, and in particular on the strengthening of paediatric services and training.

Educated at Leiden University, where he was later head assistant at the Children's Clinic, Dr Poortmann was a paediatrician in private practice in Bandung from 1936 to 1952, as well as consulting paediatrician at the Immanuel Hospital, Bandung, and the Military Hospital, Fjimahi.

This extensive experience in tropical paediatrics proved of great value in Dr Poortmann's first WHO assignment from 1955 to 1959 as Medical Officer to a WHO/UNICEF-assisted programme of rural health development in Kalutara, Ceylon, during which he helped to upgrade the children's department at the Kalutara Health Unit Hospital and to integrate the preventive and curative sides of health care at the hospital and in the field.

Medical records

Miss Carol Allegra Lewis, of the United States, has been appointed specialist in medical records with the Pan American Sanitary Bureau (PASB), which acts as the WHO Regional Office for the Americas. She will be stationed in the Buenos Aires Zone Office, where she will help Argentine officials to develop medical record systems in several hospitals that are to serve as demonstration centres for a training programme.

Miss Lewis was born in Guatemala City and is a commissioned officer of the US Public Health Service. She received her B.S. degree in Medical Records from Indiana University, Bloomington, in 1953. From 1953 until 1955 Miss Lewis was medical record librarian at the Larue D. Carter Memorial Hospital in Indianapolis, Ind. From 1955 until her PASB appointment, she was Assistant Chief, Medical Record Service, of the US Public Health Service Hospital in Baltimore, Md.

Veterinary public health

Dr David Garrick, a public health veterinarian from Canada, has been appointed to the staff of the Pan American Sanitary Bureau (PASB), which acts as the WHO Regional Office for the Americas. He will be assigned as an international consultant to the Republic of Panama, where his duties will include advising the Panamanian Government on food hygiene, the prevention and control of the zoonoses, and other aspects of preventive medicine.

Dr Garrick received his D.V.M. degree from Ontario Medical College in 1940. After service with the Canadian Navy and the United Nations Relief and Rehabilitation Administration, he resumed his studies and took his D.V.P.H. degree at the University of Toronto in 1947. From 1948 until receiving his PASB appointment, Dr Garrick was a public health veterinarian with the Simcoe County Health Unit, Barrie, Ontario.

Pharmaceutical preparations

Proposed international non-proprietary names for new pharmaceuticals are selected by members of the WHO Expert Advisory Panel on the International Pharmacopoeia and Pharmaceutical Preparations, and by sessions of a Sub-Committee on Non-Proprietary Names. Lists of the names selected are published in *WHO Chronicle*. Miss M. Girard, of the Chambre syndicale nationale des Fabricants de Produits pharmaceutiques, France, has been appointed as a temporary adviser to help in the preparation of these lists for publication, and in particular of a cumulative list including the names published in *WHO Chronicle* from October 1953 to June 1960. Miss Girard is a pharmacist, interne des hôpitaux de Paris, and a corresponding member of the French Pharmacopoeia Commission.

Dr F. Hippenmeier has been appointed consultant at the Drug Control Laboratory, Cairo, Province of Egypt, United Arab Republic, under the WHO programme of assistance to public health laboratories. A graduate in pharmacy of the Federal Institute of Technology, Zurich, Dr Hippenmeier has wide experience in the quality control of pharmaceutical preparations. He has served as Director of the Laboratory of the Swiss Pharmacopoeia Commission, and is at present Chief Pharmacist of the Canton of Zurich and Chief of the Pharmaceutical Department of the Cantonal Hospital.

Review of WHO Publications

Specifications for Pesticides : Insecticides, Rodenticides, Molluscicides, Herbicides, Auxiliary Chemicals, Spraying and Dusting Apparatus, second edition, Geneva, 1961, 523 pages, 31 figures, 2 tables. Price: £2 10s., $10.00, or Sw. fr. 30.— (clothbound).

This manual contains the specifications established by various WHO Expert Committees on Insecticides between 1950 and 1958 for the most important pesticides used in the control of human diseases and for the equipment necessary to apply these products. It is intended to serve as a guide to both manufacturers and users of such products and apparatus.

The book is divided into six main parts, dealing respectively with insecticides, rodenticides, molluscicides, herbicides, auxiliary chemicals (anti-louse products, synergists, anti-oxidants, etc.), and spraying and dusting apparatus. In the case of insecticides, rodenticides, and herbicides, specifications are given both for technical-grade products and for the various formulations made from them—concentrates, water-dispersible or water-soluble powders, dusting-powders, solutions etc.; in the case of molluscicides, specifications are given for technical products only.

By comparison with the first edition, published in 1956, the work has been considerably enlarged by the inclusion of specifications for a range of new substances and formulations. In addition, a number of specifications have been revised, mainly as regards methods of analysis. The new specifications relate to: (*a*) the insecticides chlorthion and dipterex and their formulations, diazinon and malathion dusting-powders, and larvicidal oils and granules; (*b*) the rodenticides fumarin and pival, their concentrates, the sodium salts of coumachlor, warfarin, fumarin, and pival, and water-soluble powders made from these last four substances; (*c*) the auxiliary chemicals sucrose, sodium benzoate, and tetrasodium ethylenediamine tetra-acetate. The part on herbicides is entirely new. On the other hand, no changes or additions have been made in the specifications for spraying and dusting apparatus.

Another feature of this second edition is the inclusion at the end of the volume of a series of annexes grouping together those analytical procedures that are common to several specifications, as well as the various routine test methods that are alternative to the analytical methods required by the specifications. An effort has also been made to achieve greater uniformity in the treatment and presentation of the material.

International Work in Health Statistics, 1948-1958, by H. S. Gear, Y. Biraud & S. Swaroop, Geneva, 1961, 56 pages. Price: 3/6, $0.60, or Sw. fr. 2.—.

Knowledge of the importance of a health problem rests to a considerable degree upon statistics. Exactly how serious a disease is in a population cannot properly be judged unless how often it occurs is known; without statistics, the areas in which it is most severe or the sections of the population upon which it makes the greatest inroads can be known only by impression, which is often fallacious. Statistical knowledge of disease is therefore a prerequisite to planning for health, whether nationally or internationally.

Accordingly, much of the work of the World Health Organization is concerned with health statistics. WHO not only collects and publishes health data from all over the world; it also seeks to improve national statistics and statistical services and to standardize conflicting systems of classifications of diseases and deaths so as to make the statistics of each country comparable with those of others.

This booklet, which is a reprint of a series of articles that appeared in the *WHO Chronicle* between February 1959 and May 1960, describes the work WHO has carried out from 1948 to 1958 in international health statistics. There are as well a historical introduction, a review of the

problem of collecting reliable and accurate international statistics, and a sketch of some of the specific statistical studies WHO has undertaken.

The Teaching of the Basic Medical Sciences in the Light of Modern Medicine : Eighth Report of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel (*World Health Organization Technical Report Series*, No. 209), Geneva, 1961, 31 pages. Price: 1/9, $0.30, or Sw. fr. 1.—.

Until very recently medical education has been concentrated almost entirely on the long-established curative aspects of medicine and little effort has been made to inculcate in the medical student a proper appreciation of the possibilities of preventive medicine. The eighth report of the WHO Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel [1] aims at showing how the student can be given a more balanced outlook by taking advantage of the many opportunities that arise for emphasizing the preventive aspects of medicine in teaching the basic medical sciences during the pre-clinical courses.

The report expresses concern over the grave shortage of adequately trained teachers in the basic sciences and suggests that a training scheme might be organized on an international basis, in such a way that small groups of selected persons receive short periods of instruction from specialists in the various fields. It also advocates that, since too little attention is given to the preventive aspects of medicine in existing textbooks, a new one should be prepared, written from the standpoint of " man, his life and environment ", and emphasizing the many aspects of preventive medicine to which various Expert Committees have drawn attention.

Before entering medical school, the student should already have received a good grounding in physics, chemistry and biology. The report lays emphasis on the need for modernizing the teaching of biology, which can form a valuable introduction to the student's later studies in pathology and histology. Although the science of botany is declining in importance in the medical curriculum, the study of this subject can provide an introduction to methods of evaluating the results of clinical trials and opportunities for learning the principles of carrying out epidemiological surveys.

More than half the report is devoted to a searching analysis of the subject matter to be included in the pre-clinical course and the manner in which it should be taught. The growing importance of radiation medicine makes it imperative that the medical student should be familiar with the properties of ionizing radiations, their applications, and the precautions that can be taken to prevent injurious exposure. The teaching of physiology offers considerable scope for the discarding of traditional material to make way for certain more recent developments, such as ergonomics, sociophysiology and psychophysiology. The aim must be to give the student a clear understanding of the range of responses of which the human organism is capable under diverse environmental conditions, for it is on a knowledge of the possibilities and limitations of homeostasis that specific preventive measures must ultimately be based. A sound training in biochemistry is obviously a necessary prerequisite for later instruction in bacteriology, virology, pharmacology, pathology and other branches of medical science; here, too, there are opportunities for illustrating the preventive side of medicine, such as the elimination of deficiency diseases or the correction of metabolic defects.

The fundamental aspects of genetics should, in the opinion of the Committee, have been covered before the student enters medical school, but where this is not possible instruction should be started early in the pre-clinical period. In the later part of this period, some instruction in cytogenetics can be given, but it is thought advisable that the teaching of human genetics should be postponed until the end of the clinical period. The report further underlines the importance of adequate instruction in medical psychology, which should be taught as the product of medical experience, with emphasis on the patient-physician relationship and the psychosociological consequences of disease. Next, the

[1] Members of the Committee: Dr M. Darrach, Canada (Rapporteur); Dr C. Durand, Switzerland; Dr G. Gasic, Chile; Dr W. J. Hamilton, United Kingdom (Chairman); Dr P. Rijlant, Belgium (Vice-Chairman). Secretariat: Dr S. Al-Wahbi, WHO (Secretary); Dr E. Grzegorzewski, WHO; Dr G. Payling Wright, United Kingdom (Consultant).

report discusses briefly the teaching of pathology and microbiology in the light of the preventive approach to medicine. In conclusion, attention is drawn to the many fields of interest common to the basic medical sciences, the desirability of emphasizing the interdependence between them, and the need for close collaboration between the various departments of a medical school.

Standardization of Methods for Conducting Microbic Sensitivity Tests : Second Report of the Expert Committee on Antibiotics (*World Health Organization Technical Report Series*, No. 210), Geneva, 1961, 24 pages. Price: 1/9, $0.30, or Sw. fr. 1.—.

For the determination of bacterial sensitivity to antibiotics, a variety of methods are at present in use, several of which are open to serious objections. In view of the grave consequences that would result from the dissemination in the community of resistant strains of bacteria, the universal adoption of reliable methods, standardized as far as possible, is highly desirable. This would also facilitate the comparison of the findings of different workers, particularly with regard to the frequency, importance and epidemiology of resistant strains in different institutions, areas and countries.

A WHO Expert Committee on Antibiotics [1] has reviewed the advantages and disadvantages of the main methods at present in use for determining microbic sensitivity and has recommended the methods it considers most practical for particular purposes. Dilution methods allow direct expression of the minimum inhibitory concentration of the antibiotic for a given microorganism. The liquid dilution method in tubes, although indispensable in certain circumstances, is considered to be too laborious and time-consuming for general clinical use. The solid dilution method (in plates) makes it possible to test a number of different strains on each plate and is recommended for surveys. Particular attention must be paid to the growth-supporting properties of the medium and to the possible effect of the medium on the stability of the antibiotic.

Several variants of the diffusion method are discussed. Without excluding other techniques that may be developed, the report recommends for clinical purposes the use of paper discs applied to the surface of an inoculated culture medium in a plate. The conditions that must be observed in order to obtain satisfactory results are carefully defined. Except in large, specialized laboratories, it is desirable that commercially prepared discs should be used, and the Committee expressed the opinion that each government should institute a system of control for such discs.

Rapid methods such as the diffusion test in primary plate culture, methods of estimating bactericidal action, and methods of studying continued action are considered. Special procedures are discussed for testing the antibiotic sensitivity of *Mycobacterium tuberculosis*, penicillinase-producing staphylococci, and anaerobes.

Among recommendations for further studies, the report attaches the highest importance to surveys to determine the frequency of resistance in *Myco. tuberculosis* and *Neisseria gonorrhoeae* in different parts of the world. Similar surveys in regard to several other bacteria are also proposed. It is further recommended that every effort be made to develop a highly accurate plate dilution test, that strains of known sensitivity be available for distribution, and that the possibility of producing standard antibiotic discs and improving the composition of the discs be investigated.

The Use and Training of Auxiliary Personnel in Medicine, Nursing, Midwifery and Sanitation : Ninth Report of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel (*World Health Organization Technical Report Series*, No. 212), Geneva, 1961, 26 pages. Price: 1/9, $0.30, or Sw. fr. 1.—.

The successful expansion of health services in all countries depends to a large extent on the availability of well-trained auxiliary personnel. In its ninth report, the WHO Expert Committee on Professional and Technical Education of Medical

[1] Members of the Committee: Dr A. Branch, Canada; Dr Y. Chabbert, France; Dr H. M. Ericsson, Sweden; Dr L. P. Garrod, United Kingdom (Rapporteur); Dr G. Gause, USSR; Dr A. M. Walter, Germany; Dr Maurice Welsch, Belgium (Chairman); Dr W. Wright, USA (Vice-Chairman). Secretariat: Dr W. A. Timmerman, Netherlands (Consultant); Dr R. Sansonnens, WHO (Secretary).

and Auxiliary Personnel [1] considers the training and utilization of four types of auxiliary health worker—medical assistants, auxiliary nurses, auxiliary midwives, and auxiliary sanitarians.

Emphasis is laid on the need to maintain satisfactory standards in the training of these workers, to secure for them a proper place within the health services, and to establish favourable conditions of service. The report discusses the selection of candidates for training in relation to their future functions, whether single-purpose or multi-purpose, since the type of auxiliary required will vary from country to country and from situation to situation.

Much attention is devoted to the training process—methods of teaching, content of courses, location of training schools, qualification and registration—and guidance is given on the various elements essential to the building up of sound training programmes. The importance of selecting suitable staff is also stressed, the qualities desirable in such a staff being enumerated.

The report concludes with a brief discussion of the responsibilities of professional health workers in understanding the role of auxiliaries and in supervising and evaluating their performance.

Planning of Public Health Services: Fourth Report of the Expert Committee on Public Health Administration (*World Health Organization Technical Report Series*, No. 215), Geneva, 1961, 48 pages. Price: 3/6, $0.60, or Sw. fr. 2.—.

The provision of health services in many countries in the past has been rather haphazard and designed to deal with immediate problems. In recent decades, as the concept of public health has broadened, the development of the health service has been intimately associated with a country's social and economic development. The planning of public health services has therefore become an essential part of any national development plan.

The fourth report of the WHO Expert Committee on Public Health Administration [1] broadly reviews the experience in health planning of certain countries at varying stages of development and with different social and economic systems, and considers in detail the general principles of planning and their application to a long-term national health programme. Particular stress is laid on the need for securing the full collaboration of the medical and allied professions and the interest of the general public. The report also points out that the planning of health services on an empirical basis is no longer satisfactory, and that further research in public health practice to ascertain the health needs of a community will be needed. as well as indicators for measuring levels of health on a more scientific basis.

Since the health of the people is an essential element in the economic development of a nation, public health administrators must be able to convince their governments of the value to the national economy of the health programmes they plan.

An annex to the report gives information on public health planning in Ceylon, Czechoslovakia, India, the USSR, the United Arab Republic, and the United Kingdom.

Recommended Requirements for Schools of Public Health: Tenth Report of the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel (*World Health Organization Technical Report Series*, No. 216), Geneva, 1961, 24 pages. Price: 1/9, $0.30, or Sw. fr. 1.—.

WHO recently sent a questionnaire to some 50 schools of public health throughout the world to obtain data that would be helpful in formulating recommended requirements for schools of this type. The replies received from 44 schools in 32 countries are discussed in the tenth report of the WHO Expert Committee on Professional and

[1] Members of the Committee: Mr M. Aziz, Cyprus; Mrs Hawa Ali El Bassir, Sudan; Dr N. R. E. Fendall, Kenya (Rapporteur); Miss M. M. Howard, USA; Dr I: Joseph, India; Dr F. D. L. Peeters, Belgium; Dr Margaret Read, United Kingdom (Chairman); Dr Galina Y. Volkova, USSR (Vice-Chairman). Secretariat: Miss L. M. Creelman, WHO; Dr E. Grzegorzewski, WHO; Mr J. N. Lanoix, WHO; Dr J. M. Vine, WHO (Secretary).

[1] Members of the Committee: Sir John Charles, United Kingdom (Chairman); Dr I. V. Hiscock, USA (Rapporteur); Sir Samuel Manuwa, Nigeria; Dr S. Seshagiri Rau, India; Dr A. Sauter, Switzerland; Dr A. T. Shousha, United Arab Republic; Professor N. A. Vinogradov, USSR. Representative of the United Nations: Mr M. C. Kaser. Secretariat: Dr C. K. Chu, WHO (Secretary); Sir Andrew Davidson, United Kingdom (Consultant); Dr J. S. Peterson, WHO; Dr Z. Stich, Czechoslovakia (Consultant).

Technical Education of Medical and Auxiliary Personnel.[1]

The report gives the following working definition for a school of public health: "An institution with adequate resources which, in addition to research in public health and service to the community, provides a full-time course lasting not less than one academic year, or its equivalent, covering the subjects essential to the understanding of the various problems of public health and the concepts, organization and techniques required for dealing with them, and which is open to members of the medical and allied professions seeking qualifications in public health." It goes on to describe the school's functions, listing the various categories of medical and paramedical personnel it may be required to train, the research activities it should undertake, and the services it should provide to the community through disease control programmes, model health centres, etc.

Recommendations are made on certain aspects of organization, including legal status, administration, and financing. Five major courses are suggested: public health administration; principles and practice; health statistics; epidemiology; environmental health; and microbiology. Details are given on the content of each course. Teaching methods are also considered, as well as the amount of time spent on the various types of teaching and study. Although the report is chiefly concerned with full-time public health training lasting at least one academic year, a brief mention is made of other types of course.

The report concludes with a summary of the Committee's principal recommendations, and an annex summarizes the information received in response to the WHO questionnaire mentioned above.

[1] Members of the Committee: Dr E. J. Aujaleu, France; Dr V. V. Ermakov, USSR (Vice-Chairman); Sir Edward Ford, Australia; Dr N. Jungalwalla, India (Rapporteur); Dr A. M. Kamal, Province of Egypt, United Arab Republic; Dr E. L. Stebbins, USA (Chairman); Dr Hernán Urzúa, Chile; Dr W. S. Walton, United Kingdom. Secretariat: Dr C. Díaz-Coller, PASB; Dr E. Grzegorzewski, WHO; Dr W. Hobson, WHO Regional Office for Europe; Professor M. Kacprzak, Poland (Consultant); Dr D. A. Messinezy, WHO (Secretary); Dr S. Nechaev, WHO; Dr J. L. Troupin, USA (Consultant).

Expert Committee on Chronic Cor Pulmonale: (*World Health Organization Technical Report Series*, No. 213), Geneva, 1961, 35 pages. Price: 1/9, $0.30, or Sw. fr. 2.—.

This report is reviewed in the article on pages 195-198.

Molluscicides: Second Report of the Expert Committee on Bilharziasis (*World Health Organization Technical Report Series*, No. 214), Geneva, 1961, 50 pages. Price: 3/6, $0.60, or Sw.fr. 2.—.

This report is reviewed in the article on pages 198-201.

CORRIGENDA

Vol. 14, No. 11

EPIDEMIOLOGY OF PLAGUE

This article, which was slightly condensed, contains two passages that do not faithfully reflect the intentions of the author, Dr M. Baltazard. These should be altered as follows:

page 423, left-hand column, lines 23-27

delete

Finally, investigations in several villages revealed a high murine mortality rate, which confirmed the extreme rapidity with which the infection normally disappears in the case of the rat.

insert

Finally, work carried out in the off-season in several villages where murine mortality had been high in the preceding season gave negative results confirming the extreme rapidity with which the infection normally disappears in the case of the rat.

Page 423, right-hand column, lines 4-5

delete

Immediately after Simond's discovery of natural plague in wild rodents,

insert

Once Simond had definitely proved the murine origin of human plague by showing the part played by the rat flea in its transmission,

Vol. 15, No. 2

TREATMENT OF RINGWORM BY GRISEOFULVIN

p. 64, right-hand column, lines 30-31

delete falls out, leaving bald patches.

insert breaks off, leaving patches of pseudo-alopecia.

COMMUNICABLE DISEASES

Influence of segregation of tuberculous patients for one year on the attack rate of tuberculosis in a 2-year period in close family contacts in South India—*C. V. Ramakrishnan, R. H. Andrews, S. Devadatta, Wallace Fox, S. Radhakrishna, P. R. Somasundaram & S. Velu*

Progress in the second and third years of patients with quiescent pulmonary tuberculosis after a year of chemotherapy at home or in sanatorium, and influence of further chemotherapy on the relapse rate—*S. Devadatta, R. H. Andrews, J. H. Angel, A. L. Bhatia, Wallace Fox, B. Janardhanam, S. Radhakrishna, C. V. Ramakrishnan, T. V. Subbaiah & S. Velu*

The vectors of human infections by *Wuchereria* species in endemic areas and their biology—*N. G. S. Raghavan*

Ticks (Ixodoidea) on birds migrating from Africa to Europe and Asia—*Harry Hoogstraal, Makram N. Kaiser, Melvin A. Traylor, Sobhy Gaber & Ezzat Guindy*

A parasitological survey in three selected communities in Luapula Province, Northern Rhodesia—*Fergus McCullough & Bent Friis-Hansen*

The origin of the treponematoses—*Thomas A. Cockburn*

Endemic treponematoses in the Sudan: a report on a survey—*E. I. Grin*

Valeur de la réaction de fixation du complément avec l'antigène *Treponema pallidum* ultrasoné pour le sérodiagnostic de la syphilis—*A. Vaisman & A. Hamelin*

The fluorescent antibody method in medical and biological research—*Felix Borek*

The International Standard for Human Syphilitic Serum—*M. Weis Bentzon & P. Krag*

The Third International Reference Preparation of Egg Lecithin—*P. Krag & M. Weis Bentzon*

International Standard for Antistreptolysin-O—*J. Spaun, M. W. Bentzon, S. Olesen Larsen & L. F. Hewitt*

Notes

Remarques à propos des résultats sérologiques obtenus dans la campagne de masse contre la syphilis au Maroc—*P. H. Maury & A. Weber*

Rapid and small-volume reagin tests—*John J. Andujar & Edith E. Mazurek*

Column adsorption of fluorescein-isothiocyanate-labelled antibodies—*Bruce W. Hudson*

BULLETIN OF THE WORLD HEALTH ORGANIZATION

Vol. 24, No. 2, 1961, 164 pages

Price: 10/—, $2.00, or Sw. fr. 6.—